Journal of Economic Info (JEI)
ISSN:2313-3376
www.readersinsight.net/jei

Effect of R & D Investment on Performance of Banking Sector in Pakistan.

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Abstract

Research and development activity initiates and promotes new production, increase knowledge level, and introduces new techniques of technology implementation and production. The current study presents and unveils the diversifying behavior of variables affecting the performance of banking sector and R&D investment association. cross sectional fixed effect model and random effect model utilizing ordinary least square methods were applied to secondary data collected from reliable sources of annual reports published by banks listed on Pakistan stock exchange and further such data was verified from state bank of Pakistan official sire .the data range from 2012-2017 and only 10 private banks were considered as sample size which were listed on Pakistan stock exchange. The intense literature guide that the performance of banks is affected by ROA, ROE, AND EPS. Furthermore Hausman test ass applied and it was concluded that when firm's performance is dependent variable then fixed effect is better and thee is relationship between R&D investment and performance of banks.

Keywords: *R &D Investment, Performance of banking sector, banking sector in Pakistan*

ARTICLE INFORMATION

Received: 25 November 2017
Revised: 12 January 2018
Accepted: 25 January 2018

DOI: 10.31580/jei.v5i1.111

INTRODUCTION

Research and development is the key towards long term productivity and social welfare .Moreover it enhanced the capability of organizations. In order to be more competitive in the dynamic conditions of market, organizations have to invest in R& D activities. R&D improves the organization in the area of production, technology, efficiency etc. Firms with more R&D investment had more opportunities to earn more profit (Williams 2000) Hayes & Abernathy(1980) studied that R&D is investment activity which improves performance of company in vast areas. Organizations use their resources effectively and efficiently so that they may strive in the tough competitive environment .organizations bring innovation in technology, production etc to earn more profit. Companies by way of competitive advantage invest in R&D activities and produces long term profitability by offering unique products (Donelson & Resutek 2012) argues that R&D is an expensive activity. Cooper (2008) analyzed that there exists a positive relationship between R&D and firm's profit but financial analysis provide the opposite results. R&D activities are conducted by people specialized in this area and which in turn will enhance the firm's profitability and performance .As R&D is a long term activity generating positive results even in the start .creativity in employees play a great role in increasing profit and growth of business (B.H.Hal & Lerner 2008) R&D expenditure and R&D Investment both are synonymous to each other and are highly related to uncertainty in early phases of projects (B.H.Hall 2010). The uncertainty creates the problems of funding capital in R&D, distribution between projects and the outcome with low probability success. Thus, managers clear the framework for evaluation of margin profit (Lerner, 2010; Paunov, 2012). Chan et al,(2001) concluded that investment in R&D is such as investing in intangible assets which provide help in contributing the long term growth of firm. "Successful investment in R&D results in an innovative product and service that differ from others firms" (Ehie, 2010). Companies that successfully invest in R&D and innovation are superior to their competitors. The survival of company is not only based on production of goods but also there is important role of firm's ability of producing profit from innovation. Banking relationships directly affect the R&D investment. Moreover, it affects the quality of project, nature of inputs and generation of innovation. Banks launch innovative products and improve the quality of products (Nelson, 1991). Jinyoung(2004) examined that small firms produce more patents of R&D than large firms. It means that small firms are more efficient in innovation. Schumpeter (1942) examined the relationship among the R&D investment and firm size and his conclusion disagree that firms having share take advantages in R&D market because the monopoly cannot give return on innovation. The large experimental research examine the relationship among productivity of R&D and firm size. It was examined that how patent produce from the R&D activities variate in firms size but the experimental research failed to create the result that the patent production falls the R&D activities. Empirical work by (Bustos & Lileeva, 2011; Trefler, 2010) explained that for upgradation of technologies the trade intergration increase the exports. Imports from the developing countries effect the technologies updating and productivity of a country. They also analyzed that the impact of market size on innovations show the general equlibrium impact of trade on innovations. Callon (1994) studied that the worlwide markets pressure the organizations to innovate and improving their products, process and service. Therefore, for this purpose, the innovating

underlying forces are in action to make the business atmosphere able of following the better competitive edge for the countries. Now a days research and development is measured as an assets for government and its all shareholders. The government and firms both are able to use the returns of their research and development in different channles such as licenscing and cooperation among the firms. He also claimed that research and development returns are not good for public but they are utlizable for anyone.

LITERATURE REVIEW

Albert, Nyarko, & Hughes (2005) examined the relationship among capital structure and profitability of firms listed in Ghana during 2005 to 2009. The study showed the positive, negative and natural relationship among profitability and capital structure. Similarly, the research of Abro& Abro (2005) showed the significant positive relationship among the profitability and short term debt but also it showed the significant negative relationship among profitability and long term debt and also total debt. Further, the results also showed that the Ghanaian listed firms are more dependent on the short term debt then long term debt.

Taiwan (1996) found the relationship among investment and growth of firms in modest banks. He used the panel data of firms during 1999 to 2008 and it was found that the non-linear relationship exists among the banking and innovation investment which turn to significant positive impact on firm's growth opportunities. Maintaining the relationship with two or more banks is most favorable for firms in increasing their innovation capacity and accomplishment of the significant growth.

Leonardo (2002) explored that firm's growth is significantly but negatively related to the firm size and age. Extra details regarding empirical analysis of determinants of growth going beyond the common size-age growth can be most important for economists and policymakers. Fabio Pammolli (2001) firstly examined the relationship among growth and firm size. Secondly and most commonly he studied the statistic properties which both aggregate and disaggregate the level of corporate growth and thirdly he explained the relationship among them and the process of technology innovation, imitation and competition. Maria Savona (2006) studied the two way relationship among the innovation and economic performance in service industry by using a longitudinal firm level dataset which match data from the 2nd community innovation survey CIS II (1993 to 1995). She found the positive effect of innovation on growth and productivity. More productivity and innovation act as self-reinforcing mechanism which improves the economic performance.

Engel et al. (2004) examined that the growth of innovative firms is higher than non-innovative firms. Further, he study that sale turnover rate of innovative firms is more than non-innovative firms. Yang (2005) Found that firms with intensive R&D association have higher growth rate. Niefert (2005) explored that there is positive impact of R&D investment on growth rate. Innovation activities are considered most important for the firm's productivity and sales growth. Maurizi soberod (2014) examined the relationship of lending with firm's probability exporting. He examines the total assets and debt ratio of firm. His study showed the positive effect on both decision of export and intensity of export. Moreover it has positive impact on extensive and intensive margin of export of product innovation. There is a strong relationship among the firm's international business and innovation activities. R&D and innovation activities influence the firm decision to expand the foreign market. Ehrenhard (2013) analyzed the impact of financial crisis in 2008-2009 on innovation activities. He found the change in R&D investment due to financial crisis with respect to firm's size and age. Further, he evaluates the firms market based performance which affect the R&D activities. The small size firms are found to investing more in innovation than large firms. Market values are negatively related to R&D investment during crisis. "Innovation activities include all scientific, technological, organizational, financial and commercial steps which actually lead, or are intended to lead, to the implementation of technologically new or improved products and processes" (OECD, 2002). Innovation is very wide range of proceeding, introducing and improving the products, technology, skills and method of selling and purchasing (Eurostat, 2005). R&D investment is different from other investments. Organizations are investing in human capital to get qualified workers which will create the different types of innovation (Lerner, 2010).

Sougiannis & Sanchez (1994, 2000) explained the value of research and development, cash flow and current profit expenditure reduction and its influence on higher future value. Investment in research and development are very dominant for firm's concern with higer technology division , an essentail imperative factor and a indicative expenditure, assurance of there inventive inherent to effect there competitive market and asure there variablity. The relation among the research and development investment and firms performance has induce the interest of different research. It is simply claimed by the research that these investment subscribe factfully to the firms performance.

Lev & sougiannias, saddique, &sougiannias (1996, 2005, 2001) examined that investment in research and development activites not only improve firm's performance but also made theposition of frim. The investment is profitable for businesses as it confess them to attain and boost the performance and higher the assesment by market. The direct relation among the research and development investment and firms performance take the servel duration to earn profit. Investment in research and development produce value but it always ambitious for investor to evaluate its impact on business. Kim (2003) exposed the three context, American, German and Japanes which showed the positive effects of investment in research and development on the market value and much stronger effect was found for japanes firms. Mira & Chee (2006) studied the US firms which show the positive effects on growth opporunities by measuring the ratio of market value and book value of assets. Chan & Ho (2007) examined that there is positive relation among the research and development, market return and methods of accounting. Most of the studies donot agree about the positive contribution of research and development on the market value of firms.Chan & Souggiannis (2001) analyzed that those companies which are engaged in R&D activities have significant positive difference than those who are not engaged in R & D activities. Hung & Lin (2006) investigated the relation between the intensity of research and development and Tobin'Q level in which it is proved by evidence that firms which are operating in higher sector do not matters but increase in research and development increase the chances of competitive advantage. It shows significant effects on the shareholders value measures by Tobin'Q but however it decreases the variability. It is carried out in different European financial market as indicated by the different factors of research and development like France, Germany and Britain but unfortunately, cost of research and development have negative effects on the operating firms.

Perry & Grinaker (1994) examined the profitability expectations, discretionary research and development cost in the United State of America. It analyses the effective relationship among the research and development and profitability. It is associated with increase process but it reduces at time recessions. Franzan & Rahadakirhnan (2009) analyzed the relation between the R&D cost and profit or loss. It applied the residual earning model for measuring the multiplier for the cost of R&D generating negative or positive and profit or loss for firm. Most of the firms earn profit due to the residual earning model rather than loss. The income statement includes the profit for future benefits of research and development but not include the loss in income statement. Rockoff (2009) believes that high value product is not important for traditional strategies of higher risk in R&D activities and the control on cost of production is not possible without R&D strategies.

Nvark (2001) examined the relationship among the growth, profitability and cost of research and development by using simultaneous model. It analyzes the size of firm and other factors effecting the research and development. The result shows the positive

effects of size of firm and mutual effect of profitability and growth of profitability. Jones (2000) analyzes the effects of profit and other information that affects the research and development cost. It shows that the operating profit generate the abnormal profit due to higher expense of research and development. Laura (2000) examined that innovation and enhancement in products is the factor for which firms spend more on research and development sector. It show that the enhancement of products due to input behavior and output control that create the market value for the new products. Due to the importance of research and development over time, it enhances the central place in the policies, strategies and technologies. Griliches (1979) examined the importance of research and development is so greater that divided countries into develop and undeveloped countries depending upon their investment. Accountant and others used different methods of research to contribute for research and development expenditures on economic growth. Research and development is one of the variable that affects the public policies in future and past. A firm invests in research and development influenced by the public policies. As Luftman, Lewis, & Oldbach (2010) stated that, "strategic use of information technology is now a fundamental issue for every business." It is also important to increase knowledge which can impact the information technology sector. Griliches (1979) examined that effects of research and development cost cannot be accomplished. The different factors such as good data, production approaches and policies gives average return on research and development investment in the past and in changing over time. The production approaches able to indicate the high or low return but indicates that the research and development investment is good or bad for firms. It shows that investment in research and development also has negative impact on the firms' performance. It gives the low or high return to the companies. Ehie & Olibe (2010) analyze that the competition among organization has becoming increased, and the life cycle of product become dramatically shorted. Gunday et al. (2011) examined that enterprises produce the new products, low cost, meet the customers need and increase the market competitiveness through technological innovations. It also improved the corporate profit through entering into new market arena and grows the more earning. It introduced the new products and innovative products by using the better strategies of research and development. Research and development investment provide strength to existing products to make position in market and provide the opportunities for new products to dominant in the market and improving the performance of firms.

Katila & Ahuja (2002) analyze that firms improve performance by using technological innovations and competitiveness in markets. Salim & Bloch (2009) examined that research and development enhance the existing products, produce the new products and compete the market edge that improves the firms' performance. The earlier studies show the positive relationship among the R&D intensity or innovation and measure firm performance. Henderson, Cockburn, Hagedoon & Cooldt (1994 , 2003) analyze that R&D efforts provide the innovative competence to firm and these efforts effects the firms performance in high-tech industries. Jaffer, Chen & Klepper (1986, 1996) examined the strong correlation among research and development expenditure and firms performance. Girliches (1986) analyze the significant relation among the research and development expenditure and firms productivity. Goto & Suzuki (1989) analyze the positive relationship among the growth of productivity and growth of research and development investment of firms. It shows the positive and significant effects of research and development intensity on productivity growth. It also analyzes that research and development activities have positive effect on sale growth of manufacturing firms. O'Mahony & Vacchi (2009) examined that firm invested in research and development capital especially human capital have significant effect on productivity and performance and show the positive relationship among the R&D intensity and measuring of firm performance. Xin et al. (2010) examined that technological innovations have positive effects on operating performance. Ehie & Olibe (2010) analyze that after controlling the firm size, construction and leverages, research and development affects the firm performance. Gunday et al. (2011) analyze that firm's products and marketing innovations have effect on firms' performance in manufacturing industries. Atalay et al. (2013) examined that technological innovations has positive effects on firm performance. Hart & Moore (1995) analyze the positive relationship between the profitability and leverage. Most of the firms use internal funds for the investment in projects.

Research and Development (R & D)

R&D plays a vital role in the success, performance and profitability of any business concern. R&D is used as an alternative for generating profit.(McWilliams & Siegel, 2000).previously researchers have done work to check the relationship between R&D investment and performance of the firm. Donations and charities were used as social activities of business but such R&D were not contributing towards the performance of the firms. The results of studies on Taiwanese companies from 2002-2004 suggest that R&D, donations and charities had no role in the performance because R& D activities cannot produce results in short term. R&D offers long term fiscal advantage. (Lin, Yang, & Liou, 2009).R&D have their own significance for all stakeholders of the firm, it influence the sales by depending upon the strategy adopted by the organization. It increase value addition and trust on the organization that will generate more revenue. Implementation of R&D strategy depends upon the development of business that how much it is interested in R&D activities. (Vlachos, Theotokis, & Panagopoulos, 2010).

Financial Performance

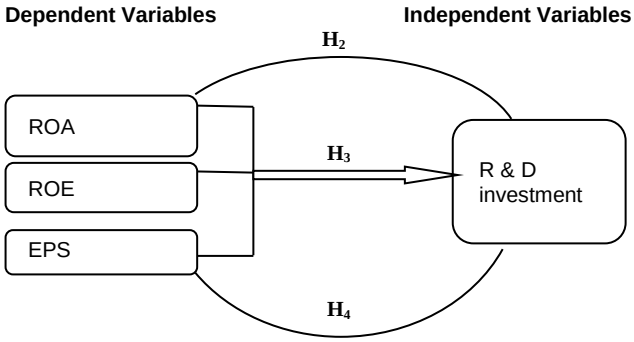
It is a matter of fact for any business to select either national or international strategy of R&D .Organizations has to be proactive and vigilant in such selection while they are operating internationally. The main factor which allows the organization to follow local strategy of R&D is the risk and lack of ownership. So, while selecting any R&D strategy, firm should keep it in mind the culture, tradition, values and beliefs of the economy in which they are operating (Muller, 2006). Multinationals pool high R&D Investment in those countries having favorable political, economical and law and order conditions. While firms having low R&D Investment level prefer to operate in those economies which are economically poor and having weak political and law and order conditions.(Dam & Scholtens, 2008). For any organization, it depends on the perception of stakeholders regarding R&D activities. Companies involved in social activities but not communicating it to the society, community and to their stakeholders will not contribute towards the performance. Performance can be increased by increasing sales, which can be achieved by changing the intentions, mindset of consumers to buy products of such company which is engaged in development and betterment of society. (Lee & Shin, 2010).financial performance of the firm depends on the perception level of stakeholders towards its social responsibility. If the company is already involved in social responsibility and activities but the stakeholders are ignorant of all such then it would really be vague. Global Reporting Initiatives (GRI) and Balanced Score Card (BSC) are the two approaches companies are following to make the stakeholders judge the firm's social activities and responsibility (Costa & Menichini, 2013).

METHODOLOGY

The research study via thorough study of previous findings and literature uncovers and explore the diverse behavior of variables affecting the performance of banks. It focuses on the approaches that influence R&D Investment on performance of banks. Methodology includes cross sectional fixed effect model and random effect model to analyze the data.

Framework of Study

Previous studies and literature reveals the relationship between R&D Investment on performance of banks.



Following research hypotheses were formulated:
H_1: Random effect is less robust than fixed effect.
H_2: There exist relationship between R&D investment and ROA.
H_3: There exists relationship between R&D investment and ROE.
H_4: There exist relationship between R&D investment and EPS.

Unit of analysis

Current study considers private banks listed on Pakistan exchange as population while 10 banks were selected as sample. This study will help private banks of Pakistan to monitor their performance and R&D investment more efficiently. The results will measure the association degree between R & D Investment and ROA, ROE, and EPS.

Data collection and Sampling:

Secondary data was collected from financial statements and annual reports of private banks listed on Pakistan Stock Exchange covering period of 5 years from 2012-2017.The authenticity of data was also verified from audited annual reports and balance sheet analysis issued by State Bank of Pakistan.

Data Analysis Method/

Advanced econometric techniques, OLS (Ordinary least square method) to check the association between dependent and independent variables, fixed effect model and random effect model was used to conduct detailed panel data analysis. In order to check the robustness of data Hausman specification test was used.

RESULTS AND DISCUSSION

In table 1 the relationship of firm's performance with R&D investment is measured by using random effects by estimated generalization least square. Here ROA is taken as dependable variable and R&D investment as in dependable variable .Results depicts that ROA and firm performance has positive and significant relationship as the value of coefficient is 16.711390 whereas the value of probability is 0.0000.ROA and R&D investment has 10.24% relationship between them. Further the model is statistically fit as value of F is 19.030 and probability is 0.0000 hence HO2 is rejected.

Table 1. Dependent Variable: ROA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.7869200	0.8115010	4.6665610	0.0000
R & D	16.711390	3.5232320	4.7431990	0.0000
R- Squared	10.240910		Prob (F-statistics)	0.0000

In table 2 explains the relationship of firm's performance (ROE) with R& D Investment by using random effect by estimated generalized least square. Hence ROE is dependable variable and R&D investment is in dependable variable .Results explicit that ROE and firm's performance has positive and significant relationship as the value of coefficient is 30.80647 and value of probability is 0.000 further ROA and R&D investment has 75.0% relationship. The model is statistically fit as value of F is 11.95 and probability is 0.0000.Hence H_{O3} is rejected.

Table 2. Dependent Variable: ROE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.30990	1.088570	3.95920	0.00020
R & D	30.806470	4.6472810	6.6289230	0.00000
R- Squared 0.750			Prob (F- Statistics)	0.0000

Table 3. Dependent Variable: EPS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.3140	1.67150	4.97450	0.00000
R & D	14.6700	7.1920	2.0390	0.00000
R- Squared 0.460			Prob (F- Statistics)	0.0000

Table 3 shows the relationship of firm's performance (EPS) with R&D investment by using random effect by estimated generalized least square. Hence EPS is dependable variable and R&D investment as in dependable variable. Results shows that EPS and firm's performance has positive and significant relationship as the value of coefficient is 14.6700 and probability as 0.0000.EPS and R&D investment has 46.0% relationship. This model is statistically fit as value of F is 7.825 and probability is 0.0000.Thus H_{O4} is rejected.

Table 4. Dependent Variable: ROA

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.453110	2.01050	2.214920	0.02910
R & D	13.730	4.892760	2.806180	0.0060
Prob(F- Statistics) 0.0000			R Squared 0.670	

Table 4 shows the relationship of firm's performance (ROA) with R&D Investment with fixed effect by estimated generalized least square .Here ROA is taken as dependable variable and R&D investment ad in dependable variable .Results shows that ROA and firm's performance has positive significant relationship as the value of coefficient is 13.73 and the value of probability is 0.0291 .There exist 6.70% relationship between ROA and R&D Investment. The model is statistically fit as the value of F is 7.830 and probability is 0.0291.

Table 5. Dependent Variable: ROE

Variable	Coefficient	Std.Error	t-Statistic	Prob.
C	5.7312920	2.7990000	2.0476210	0.04330
R & D	24.445290	7.9867580	3.0607280	0.00280
R squared 0.0850			Prob (F-Statistics)	0.0000

In table 5 the relationship of firm's performance(ROE)is checked with R&D investment by using fixed effect by estimated generalized least square .ROE is taken as dependable variable and R&D and in dependable variable .Results shows that there is positive and significant relationship between ROE and firm's performance as the value of coefficient is 24.445 while value of probability is 0.04330.There exist 8.50% relationship between ROA and R&D investment .The model is statistically fit as value of F is 9.10 and probability is 0.04330.

Table 6. Dependent Variable: EPS

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.8199460	3.2447580	2.1018350	0.03810
R&D	21.360	9.680	2.2050	0.0290
R- Squared: 0.0470			Prob (F-Statistics):	0.0000

Table 6 shows the relationship of firm's performance EPS with R&D investment with fixed effect by using estimated generalized least square.EPS is taken as dependable variable with R&D investment as in dependable variable .Results shows that there is positive and significant relationship between EPS and firm's performance as the value of coefficient is 21.360 while value of probability as 0.03.There exist 4.70% relationship between ROA and R&D investment .the model is statistically fit as value of F IS 4.90 and probability as 0.03810.

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Table 7. Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.2016280	1	0.65340

Table 8.

	ROA	R & D	ROE	EPS
Mean	7.5210300	0.2234470	11.193520	11.593060
Median	5.3900000	0.1945000	8.6900000	8.5200000
Maximum	44.600000	0.7222000	67.890000	77.370000
Minimum	11.880000	0.0089000	9.9400000	21.250000
Std. Dev.	8.2374180	0.1759670	11.747230	13.782860
Skewness	1.6271600	0.8285220	1.7577360	2.0363960
Kurtosis	7.466300	3.009803	8.011970	9.656506
Jarque-Bera	127.24350	11.441220	156.15990	253.73630
Probability	0.0000000	0.0032780	0.0000000	0.0000000
Sum	752.10300	22.344700	1119.3520	1159.3060
Sum Sq. Dev.	6717.6500	3.0654600	13661.740	18806.760
Observations	100	100	100	100

Table 7 shows that the results of Hausman test explicit the causal relationship between in dependable and dependable variables. The Hausman test has the following null and alternate hypothesis

H_O: Random effect is more robust than fixed effect.

H_1: Random effect is less robust than fixed effect.

Value of P 0.065340 as per table 7 shows insignificance .Thus null hypothesis that is random effect is more robust then fixed effect cannot be rejected so, random effect model is more robust in banking industry in Pakistan.

CONCLUSION

R&D activities produce innovations in productions, technology and knowledge etc. It is the fundamental key to long run productivity and performance of any concern. R& D investment is a value addition activity that enhances the efficiency and capability of company. In order to be more competitive and face the tough marker condition ,it is the need of hour to invest in R& D activities .the current study concludes that the factors related to performance of banking sector of Pakistan like ROA,ROE,EPS has significant impact on the performance of banking sector of Pakistan. Hausman test was applied and it was found that when form performance is dependent variable than fixed effect is better .hence it is concluded that there is significant relationship between R &D investment and performance of banks.

LIMITATIONS

The study was limited to sample size of 10 private banks listed on Pakistan Stock Exchange from year 2012-2017.Investment banks and corporate banks were excluded from the sample, future researchers have direction to work on the same topic by increasing sample size covering data period more than 5 years, further it has more insight to work on other sector of economy nationally and internationally.

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