

The Effect of Research and Development(R & D) Expenditures on Firms Value

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This research has attempted to examine the effect of Research and Development (R&D) expenditures on firms value. Criteria that have been considered for firms value include operational profit, dividend, operational assets, book value and other information. For this purpose the market value of firms (pharmaceutical firms) which have R&D has been compared with those lacking that, using the Jones model (Jones, 2000). Results from testing the hypotheses have reflected that R&D increases sales and expenses as well; moreover the persistence of abnormal earnings shall increase but would have no impact on market value.

Key Terms: Research and Development Expenditure, Earnings Persistency, Abnormal Earnings.

JEL: O32.

1.Introduction

R&D includes all sources used for carrying out activities that have been specially formulated for the generation of research results. The activities may include those carried out by an independent interior or exterior unit (Britt, 2007).

Research and development activities can be summarized within the following context:

- A. Experimental activities that contain innovation or a high level of technical risk which is performed for the purpose of gaining better knowledge (whether it is gained or not), material, products, design, processes or new services and/or the improvement of these.
- B. Other activities that relate directly or indirectly with the mentioned activities (Rogers 1998).

The Merton model (1990) or the structured model with a history of seventy years, considers firm value to be related to securities available to structured firms, much in the same manner as the value of assets and liabilities of the company (Fantazzini, De Giuli & Mario, 2007).

To determine firm value two types of models have been introduced:

First, accounting models which determine stocks' value based on the multiplication of the company income by the transforming income to value coefficient. Second, economic models which determine a company stocks' value based on the ability of assets in generating income and potential investments and the difference between

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Mojtahedzadeh & Abedi

the rate of return and the cost of capital in the firm (Jahankhani and Zarif Fard, 1995).

A firm's activities and R&D are related to the persistence of abnormal earnings. Experience indicates that with regards to the negative impact of the high risk in R&D projects, the positive effect of R&D activities on abnormal earnings from earnings persistence is due to the applicability of R&D in maintaining competition. In fact investment in R&D results in increased earnings persistence. When R&D investment with hedging leads to a competitive position in the market; companies become interested in such an investment; therefore differentiating themselves from their competitors in the products they offer. When competitors supply the market with a similar product, the company would then be able to present its new product based on the R&D activities and to maintain its competitive position in the market (Thomas, 2001).

The R&D strategy has a significant impact on the instability of stock prices throughout the discovery and development periods. Companies with a greater diversity in their products and service portfolios, and higher R&D activities face less instability in stock prices and low returns (Shortidge, 1999).

Investment in R&D activities creates added value for firms (Golloto & Kim, 2003); and increases stock value (Shelvin, 1991).

Primary researches on market behavior in regards with R&D expenditure indicates that such costs are treated as assets. Therefore in case investments made in R&D are treated as expenses in the year that they incur, a very significant asset shall be deleted from the balance sheet (Feltham & Ohlson, 1995).

A very strong positive relationship exists between stock market value and R&D costs (Trajtnbe & Hall, 1999). The coefficient of stock price reaction to R&D expenditure is positive with regards to expected future return from investment in R&D (Lev & Zarowin, 1998). If R&D costs are wholly capitalized and depreciated according to the industry's useful life, the ability of net income and book values in indicating stock price increases (Chambers, Jannirgs & Thompson, 1998).

Due to the significance of R&D costs, the effects of such costs on firm value shall be examined further.

2. History of Research

Golloto & Kim (2003) examined the effects of the rate of R&D costs on the market value of Dot Com firms. Dot Com firms are companies whose stocks are exchanged daily in the stock exchange market. Results reflected that a higher rate of R&D costs in proportion to total costs gives us the message that potential future growth is expected for the firm which is ascertained with an increase in stock price.

Davis and Owens (2003) applied the traditional approach of discounted cash flows, an approach where in the guaranteed value or optimal timing was not considered, and finally a real option approach that utilizes financial markets for the purpose of Renewable Electric (RE) technology. They realized that RE technology is

Mojtahedzadeh & Abedi

economically attractive only in situations of optimal timing and certainty of the products value. Moreover, when applying the real option approach, the measured optimal investment levels of R&D in RE technology equaled 1.2 billion dollars annually.

Xu (2005) realized that the R&D strategy has a significant impact on lowering stock price instability throughout the discovery and product diversifying stage in pharmaceutical industries. His study included 776 samples from the year 1998 to 2001. Regression analysis reflected that companies with a more diversified pharmaceutical portfolio due to R&D investments enjoy a lower price instability and stock yield. Other factors influencing stock price include company growth, company size and the ratio of book to market value.

Sharad and Zhang (2006) applied the Olson evaluation model to examine the relationship between R&D costs and the persistence of abnormal earnings. According to their research which was carried out from 1982 to 2001 contrary to previous studies which considered the industry as a R&D index, R&D costs were divided into two categories. The first category included average industry R&D costs (industry influenced) and the second involved companies focused on R&D costs (company influenced). Ultimately the effects of both categories on the persistence of abnormal earnings were studied. They realized that both categories have a positive relationship with abnormal earnings. Moreover the positive effect of the efficiency of R&D costs on earnings persistence and the creation of a competitive merit are quite more significant than the negative effects of R&D project risks. Also it is not only the industry which plays a role in predicting earnings persistence but rather it is the investment of the owners in R&D costs that is indicative of the firm's efforts in producing diverse and different products and the measurement of earnings persistence .

Anagnostopoulou (2008) performed a thorough research on the relationship between R&D activities and market reactions from 1978 to 2007. Results indicated a very strong positive relationship between R&D and market reactions. Moreover economic traits, predicted performance, actual performance, capital structure and risk do affect market reaction as well.

Hughes (2008), applied the General Method of Moments (GMM) to evaluate firm value. His research included 8559 observations between the years 1994 and 2005 in British companies. He realized that R&D index has a very positive correlation with firm value; yet the impact is less than R&D expenditure.

Franzan and Radhakrishnan (2009) evaluated the relationship between R&D costs and the value of profitable or loss generating firms. They applied the residual earnings model to illustrate that the multiplier for R&D costs would probably be negative (positive) for profit (loss) generating firms. This is due to the fact that the dynamics of linear information in the residual earnings model is mostly appropriate for profit generating firms rather than loss generating ones. The income statement for income generating firms includes information on future benefits of R&D; while no such information is presented in the income statement of loss generating firms. Empirical evidence approves predictions made by researchers for loss generating firms.

Rockoff (2009) believes that the high value for a product is not necessarily due to the traditional strategies of high risk R&D activities; however, concentration on activities with economic merits and the control of the cost of production and assets would not be possible without the application of R&D strategies.

3. Research Hypotheses

Upon the research literature and history, the following hypotheses were formulated:

First Hypothesis: A significant relationship exists between R&D expenditure and the volume of firm sales.

Second Hypothesis: A significant relationship exists between R&D expenditure and the reduction of firm total expenditure.

Third Hypothesis: Operating profit in firms with R&D expenditure is evaluated lower by the market as compared to companies without that.

Forth Hypothesis: A significant relationship exists between R&D expenditure and the persistence of abnormal earnings.

4. Method of Research

To carry out tests, descriptive and deductive statistics have been used. Operational profit, book value, dividend, operational assets and other information, are considered the independent variables and market value the dependent variable. Firm value is considered a criterion for the generation of income (Jones, 2000).

Persistence coefficients for companies with R&D expenditure differ from those without such costs; this is due to the fact that the intangible nature of such costs may lead to less earnings persistence as compared to firms with little or no R&D activities. The other reason for this could be that nowadays the life cycle of a product is less and products are becoming obsolete faster than before (Wallman, 1995).

Thus the relationship between the level of investment in R&D expenditure and income generation can be determined through firm value. For this purpose the following equation is used (Jones, 2000) :

$$MV_t = \beta_1 b_t + \beta_2 x_t + \beta_3 d_t + \beta_4 oa_t + \beta_5 (f_{t+1} - \omega_{11} x_t)$$

MV_t = Firm market value in time t

b_t = Firm book value in time t

x_t = Operating assets in time t

oa_t = Firm operating profit in time t

f_{t+1} = Prediction of net income for time t+1

$(f_{t+1} - \omega_{11} x_t)$ = Other information

Mojtahedzadeh & Abedi

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ were calculated using the following equation (ibid):

$$\beta_1 = \frac{(1-y)(1-\omega_{11})(1+r)}{(1+r-\omega_{11})(1+r-y)} \quad \beta_2 = \frac{\omega_{11}(1-y)(1+r)}{(1+r-\omega_{11})(1+r-y)}$$

$$\beta_3 = \frac{y\omega_{11}r}{(1+r-\omega_{11})(1+r-y)} \quad \beta_4 = \frac{\omega_{12}(1+r)}{(1+r-\omega_{22})(1+r-\omega_{11})}$$

$$\beta_5 = \frac{(1+r)}{(1+r-\omega_{11})(1+r-y)}$$

r = Firm return

ω_{11} = Persistence coefficient of abnormal earnings $0 \leq \omega_{11} \leq 1$

ω_{12} = Correction coefficient for operating assets $\omega_{12} \geq 0$

ω_{22} = Growth of operational assets $1 \leq \omega_{22} < (1+r)$

y = Persistence coefficient of other information $|y| < 1$

In this equation persistence coefficients which are y and ω_{11} have been extracted using the time series information and through regression and using the following equations (ibid):

$$x_{t,t+1}^a = \omega_0 + \omega_{11}x_{t,t}^a + \varepsilon_{t,t+1} \quad (\text{A})$$

$$v_{t,t+1} = y_0 + y_1v_{t,t} + \varepsilon_{t,t+1} \quad (\text{B})$$

v_t = Other information about future abnormal earnings not contained in current abnormal earnings.

x_t^a = Other information about future operating earnings not contained in current operating earnings.

To estimate the persistence coefficient of abnormal earnings, equation (A) and for estimation of the persistence coefficients of other information, equation (B) was applied.

In equations (A) and (B) variables $x_{t,t}^a$ and $v_{t,t}$ are defined as follows (ibid):

$$x_{t,t}^a = x_{t,t} - rb_{t,t-1}$$

$$v_{t,t} = (f_{t,t+1} - rb_{t,t}) - \omega_{11}(x_{t,t} - rb_{t,t-1})$$

Since correction coefficient of operating assets has been defined as $\omega_{12} \geq 0$ it will be added to 0.5 according to statistical methods to place the operating assets in a normal range within the population or in other words to consider the conservativeness in operating assets (Toorani, 2006).

Mojtahedzadeh & Abedi

R has also been estimated using the following equation (Jones, 2000):

$$r_e(j,t) = r_f(t) + r_{prem}(j)$$

$r_e(j,t)$ = The expected rate of return of company j in period t

$r_f(t)$ = Risk free rate of return

$r_{prem}(j)$ = Risk Premium

To test the first hypothesis the following regression was used:

$$SALE_{i,t} = \alpha + \beta(R \& D \text{ expenditure})_{i,t} + \varepsilon_{i,t}$$

The two significant procedures in this research are: first the effects of R&D expenditure on sales in companies with R&D (pharmaceutical companies) was evaluated and then to compare the volume of sales in firms with and without R&D, using virtual variables the difference between sales was studied.

The regression equation relating to the second hypothesis is shown as follows:

This hypothesis is again testing the impact of R&D expenditure on the reduction of total expenditure through the application of two independent procedures. In the first procedure the impact of R&D on the reduction of expenditure within pharmaceutical companies was tested, and in the second procedure a comparison was made between these effects in pharmaceutical and non-pharmaceutical companies through the application of virtual variables as the independent variable.

To examine the third hypothesis it was necessary to multiply R&D as a virtual variable (for pharmaceutical companies a value of one and for non-pharmaceutical companies a value of zero has been considered) by the dividend and operational income and to fit it within the regression model. Thus the regression equation related to this hypothesis would be as follows:

$$MV_{i,t} = \beta_1 b_{i,t} + \beta_2 x_{i,t} + \beta_3 d_{i,t} + \beta_4 oa_{i,t} + \beta_5 (f_{i,t+1} - \omega_{11} x_{i,t}) + \beta_6 R \& D_{i,t} + \beta_7 (R \& D * x_{i,t}) + \beta_8 (R \& D * d_{i,t}) + \varepsilon_{i,t}$$

In this regression equation, the dependent variable would be market value of the firm and the independent variables would be as follows:

b_t = Book value of the firm in period t

x_t = Operating profit of the firm in period t

oa_t = Operating assets in period t

d_t = dividend in period t

$(f_t + 1 - \omega_{11} x_t)$ = Other Information

$R\&D_t$ = Research and Development expenditure in period t

$R\&D * x_t$ = Research and Development expenditure multiplied by operating income

$R\&D * d_t$ = Research and Development expenditure multiplied by dividend.

To test the fourth hypothesis, the following regression equation was applied:

$$\omega_{11} = \alpha + \beta_1 d_{i,t} + \beta_2 x_{i,t} + \beta_3 R \& D_{i,t} + \beta_4 (R \& D * x_{i,t}) + \beta_5 (R \& D * d_{i,t}) + \varepsilon_{i,t}$$

In this equation, the dependent variable, ω_{11} , reflects the persistence of earnings and descriptive variables are the same as variables applied in the third hypothesis.

5.Results of Testing the Hypotheses and Analysis of Findings

5.1.First Hypothesis: A significant relationship exists between R&D expenditure and the volume of firm sales.

To test this hypothesis two issues were examined. First, a regression equation was estimated with the inclusion of Research and Development expenditure in order to evaluate the effect of it on sales variable. Therefore companies with R&D (Pharmaceutical companies) have been chosen.

Second, to compare the volume of sales of pharmaceutical companies (companies with research and development expenditure) and non-pharmaceutical companies the regression equation was estimated using R&D as a virtual variable. It is noteworthy that the regression form is same in both phases (Gujarati, 2005):

$$SALE_{i,t} = \alpha + \beta(R \& D \text{ expenditure})_{i,t} + \varepsilon_{i,t}$$

Hypotheses H_0 and H_1 have been formulated as follows:

- $\left\{ \begin{array}{l} H_0: \text{Research and Development expenditure does not lead to a rise in the volume of firm sales.} \\ H_1: \text{Research and Development expenditure leads to a rise in the volume of firm sales.} \end{array} \right.$

Statistical hypotheses are as follows:

- $\left\{ \begin{array}{l} H_0: \beta \leq 0 \\ H_1: \beta > 0 \end{array} \right.$

5.1.1.First Testing

A positive value for the coefficient of R&D indicates positive effect of Research and Development expenditure on the volume of firm sales. Considering the amount resulting from calculations and its significance ($p\text{-value} < 0.05$), a unit increase in R&D of a firm reflects a 14 percent increase in sales. Thus the first hypothesis is approved.

All validity factors within the regression, such as values for the F parameter, the determining coefficient D-W, are representative of a high statistical validity of the regression equation. Since in most statistical calculations, 7 determines the borderline amount for determining the validity of the regression (Moradi, 2005), the

parameter F in the first regression model (19.66064) indicates the high statistical validity of the regression. The probability of this parameter has also resulted in a value of zero which indicates a high validity for the regression model (ibid). Moreover the D-W amount (2.274764) is very close to 2 which reflects an absence of auto-regressiveness.

5.1.2. Second Testing

In this set of tests which have been performed for purposes of comparing the volume of sales within a pharmaceutical company and non-pharmaceutical ones, R&D has been applied as a virtual variable. Thus a value of one for all pharmaceutical companies and a value of zero for non-pharmaceutical firms was considered. The value of this coefficient within a regression model is not significant.

The Research and Development variable has been reflected in the regression model with a positive and significant sign. This means that Research and Development activities in a firm result in an increase in the volume of sales.

5.2. Second Hypothesis: A significant relationship exists between R&D expenditure and the reduction of firm total expenditure.

To test this hypothesis again two set of examinations were made. First, according to the Research and Development expenditure in firms and the level of their total expenditure, a regression model was estimated to determine the impact of R&D on expenditure variable. Second, to compare the level of expenditure in a pharmaceutical company (companies with R&D) and non-pharmaceutical ones a regression equation was estimated using R&D as a virtual variable.

The regression equation is the same in both phases (Gujarati, 2005):

$$Total\ expenditure_{i,t} = \alpha + \beta(R\ \&\ D\ expenditure)_{i,t} + \varepsilon_{i,t}$$

H_0 and H_1 hypotheses were formulated as follows:

- H_0 : Research and Development expenditure does not lead to a decrease in firm total expenditure.
- H_1 : Research and Development expenditure leads to a decrease in firm total expenditure.

Statistical hypotheses were formulated as follows:

- $H_0: \beta \geq 0$
- $H_1: \beta < 0$

The positive value for R&D variable indicates the positive effect of Research and Development expenditure on firm total expenditure.

5.2.1. First Testing

The resulting figure and its significance (p-value < 0.05) reflect that a unit increase in Research and Development expenditure results in a 10 percent increase in firm

sales. Thus the second hypothesis is not approved. In other words an increase in Research and Development expenditure has not resulted in a reduction in firm expenditure.

All validity factors within the regression, such as values for the F parameter, the determining coefficient D-W, are representative of a high statistical validity of the regression equation. the parameter F in the regression model (24.98373) indicates the high statistical validity of the regression. The probability of this parameter has also resulted in a value of zero which indicates a high validity for the regression model. Moreover the D-W amount (2.253081) is very close to 2 which reflects an absence of auto-regressiveness of errors in the regression (Moradi, 2005).

5.2.2. Second Testing

In this phase tests were performed for the comparison of the level of expenditure in pharmaceutical and non-pharmaceutical companies, and the Research and Development variables were considered as a virtual variable. Thus a value of one for all pharmaceutical companies and a value of zero for non-pharmaceutical firms was considered. The value of this coefficient within a regression model is not significant. The Research and Development variable has been reflected in the regression model with a positive and significant sign and reflects that the Research and Development activities in a company result in an increase in the expenditure. Thus in the second testing phase the second hypothesis was not approved as well.

5.3. Third Hypothesis: Operating profit in firms with R&D expenditure is evaluated lower by the market as compared to companies without that.

For this purpose the virtual variable R&D was used as a coefficient in the regression model. Thus the effects of the variable on market value of pharmaceutical companies have been evaluated through the multiplication of the variable by variables such as the operating profit and dividend. The negative value for the operating profit variable means a lower estimated figure for the firm market value (Jones, 2000).

The regression model is :

$$MV_{i,t} = \beta_1 b_{i,t} + \beta_2 x_{i,t} + \beta_3 d_{i,t} + \beta_4 oa_{i,t} + \beta_5 (f_{i,t+1} - \omega_{11} x_{i,t}) + \beta_6 R \& D_{i,t} + \beta_7 (R \& D * x_{i,t}) + \beta_8 (R \& D * d_{i,t}) + \varepsilon_{i,t}$$

H₀ and H₁ hypotheses have been formulated as follows:

- H₀: The market does not evaluate lower the operating profit of companies with Research and Development expenditure as compared to companies without that.
- H₁: The market evaluates lower the operating profit of companies with Research and Development expenditure as compared to companies without that.

Mojtahedzadeh & Abedi

Statistical hypotheses are:

$$\left\{ \begin{array}{l} H_0: \beta_8 \geq 0 \\ H_1: \beta_8 < 0 \end{array} \right.$$

The five descriptive variables for the regression model that is book value, operating profit, dividend, operating assets and other information overall contain important information and have significant coefficients (probability of at least 95%). Considering the sign of the variables, merely operating assets have a negative effect and the other items have a positive effect on the firm market value. Yet the interesting point is the evaluation of significance of the operating profit variable in pharmaceutical companies. In other words, what is examined here is the result of multiplying operating profit by the virtual variable, Research and Development expenditure. Results indicate that the variable has a positive yet not significant coefficient. In other words, operating profit in pharmaceutical companies is not evaluated for a lower value by the market. Thus the third hypothesis is not approved. Considering the value for p-value = 0.3810 > 0.05, it can be concluded that Research and Development expenditure in a company do not result in a lower evaluated operating profit by the market. Moreover, dividend in pharmaceutical companies has a negative but significant effect in the 90% probability level (p-value = 0.0761 < 0.10).

Amounts for regression validity parameters which have been illustrated in the far right side of table 5 indicate the validity and acceptance of results from regression equations.

5.4. Forth Hypothesis: A significant relationship exists between R&D expenditure and the persistence of abnormal earnings.

H_0 and H_1 hypotheses were formulated as follows:

$$\left\{ \begin{array}{l} H_0: \text{Persistence of abnormal earnings is not higher in firms with Research and Development expenditure.} \\ H_1: \text{Persistence of abnormal earnings is higher in firms with Research and Development expenditure.} \end{array} \right.$$

To test the hypothesis the following regression model was used (Jones, 2000):

$$\omega_{11} = \alpha + \beta_1 d_{i,t} + \beta_2 x_{i,t} + \beta_3 R \& D_{i,t} + \beta_4 (R \& D * x_{i,t}) + \beta_5 (R \& D * d_{i,t}) + \varepsilon_{i,t}$$

The hypothesis attempts to examine the statistical validity of the β_3 coefficient which is the R&D coefficient. The statistical hypotheses, H_0 and H_1 were formulated as follows:

$$\left\{ \begin{array}{l} H_0: \beta_3 \geq 0 \\ H_1: \beta_3 < 0 \end{array} \right.$$

As expected, the coefficient for the Research and Development variable in the regression model has a positive sign. That is, the persistence of earnings in pharmaceutical companies is 4% higher than non-pharmaceutical companies.

Mojtahedzadeh & Abedi

Therefore the fourth hypothesis is approved. The other significant finding is that the operating income variable which has a general increasing effect on the persistence of company earnings, leads to a decrease in earning persistence in pharmaceutical companies. In other words, the incurrence of Research and Development expenditure in pharmaceutical companies results in a reverse impact by the operating profit variable. The dividend also shows a contrast in signs between pharmaceutical and non-pharmaceutical companies. But since the coefficient of the dividend variable is not significant, it does not lead to a reverse effect on earnings persistence.

The validity criteria within the regression as illustrated in table 6 present desirable amounts.

6. Conclusion

The present research studies the impact of Research and Development expenditure on firm value. Accordingly, with regards to the research literature two general hypotheses were formulated for sales and expenditures and subsequently two other more detailed hypotheses were formulated to examine the effects of Research and Development expenditure on firm value. Results indicated that R&D leads to an increase in the level of sales and expenditure which are in accordance with findings by Rockoff (2009) and studies performed by General Electric Co. (1980). Moreover Research and Development expenditure has no impact on market value and leads to earnings persistence. Findings are in accordance also with researches performed by Sharad and Zhang (2006), Thomas (2001), Gaver & Gaver (1993), Kamien and Schwartz (1975) yet differ from results in researches performed by Jones (2000).

Table 1: Estimated Values for Coefficients of Pharmaceutical Companies

	Coefficient	t-Static	P-Value	D-W	2.274764
α	165364.5	6.436282	0.0000	F-Static	19.66064
<i>R&D expenditure</i>	0.144135	7.200984	0.0000	P-Value	0.000019
R²	0.131368				
Adj-R²	0.124686				

Table 2: Estimated Values of Coefficients in Pharmaceutical and Non-Pharmaceutical Companies

	Coefficient	t-Static	P-Value	D-W	2.360126
α	34632.72	7.071842	0.0000	F-Static	449719.1
<i>R&D expenditu</i>	11525.09	5.541536	0.0000	P-Value	0.000000
R²	0.899718				
Adj-R²	0.899715				

Mojtahedzadeh & Abedi

Table 3: Estimated Values of Coefficients in Pharmaceutical Companies

	Coefficient	t-Static	P-Value	D-W	2.253081
α	112206.1	15.63471	0.0000	F-Static	24.98373
<i>R&D expenditure</i>	0.107038	4.998373	0.0000	P-Value	0.000002
R²	0.161202				
Adj-R²	0.154750				

Table4: Estimated Values of Coefficients in Pharmaceutical and Non-Pharmaceutical Companies

	Coefficient	t-Static	P-Value	D-W	1.877590
α	-164728.7	-8.212345	0.0000	F-Static	26.84292
<i>R&D expenditure</i>	54362.97	2.609600	0.0093	P-Value	0.000000
R²	0.041434				
Adj-R²	0.039891				

Table 5: Estimated Values of Coefficients in the Third Hypothesis

	Coefficient	t-Static	P-Value		
b_t	0.838865	5.134096	0.0000	D-W	2.312765
x_t	0.822841	1.985459	0.0477	R²	0.860346
d_t	105.8373	4.404257	0.0000	Adj-R²	0.857515
oa_t	-0.739881	-3.115836	0.0020	P-Value	0.000000
$(f_{t+1} - w_{11}x_t)$	0.810393	1.946843	0.0522	F-Static	132.6443
R&D_t	151562.7	1.955369	0.0512		
R&D_t value	4.453688	0.867815	0.3860		
R&D * x_t	0.480716	0.876889	0.3810		
R&D * d_t	-72.43575	-1.777767	0.0761		

Table 6: Estimated Values for Coefficients in the Fourth Hypothesis

	Coefficient	t-Static	P-Value	D-W	2.149264
α	0.958763	748.9636	0.0000	F-Static	329.4580
$x_{i,t}$	$4.58 \cdot 10^{-9}$	6.634190	0.0000	R²	0.734974
$d_{i,t}$	$-1.51 \cdot 10^{-6}$	-0.320411	0.7488	Adj-R²	0.732743
R&D_{i,t}	0.041933	32.54457	0.0000	P-Value	0.000000
R&D * $x_{i,t}$	$-1.35 \cdot 10^{-8}$	-3.756475	0.0002		
R&D * $d_{i,t}$	$2.44 \cdot 10^{-6}$	0.515349	0.6065		

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Mojtahedzadeh & Abedi

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