Investigate the Effect of Research and Development Costs on Future Returns and Earnings Forecasts of Listed Companies in Tehran Stock Exchange

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ABSTRACT: The main objective of this study is to investigate the effect of research and development expenditures on the two variables of future returns and earnings forecast in the listed company in Tehran Stock Exchange. In other words, in this study we have tried to answer these questions whether research and development expenditures has a significant and positive relationship with future returns or not? And also whether research and development expenditures has a significant and positive relationship with earnings forecast or not? For this purpose, the multivariate regression model is estimated using the financial information related to 45 listed companies in the Tehran Stock Exchange for the period 2007 to 2012 using panel data. The findings of this research suggest that there is no significant relationship between future returns and R&D costs and also there is negative and significant relationship between earnings forecast and the research and development costs.

Keywords: Research and development, investment, future returns, total returns, earnings forecasts.

Introduction

Nowadays, research and development activities are fundamental and basic platform for the transfer from resources-based economy towards knowledge-based economy in the countries around the world and provides context for formation of Knowledge-based and research-based activities. Scientific gap between developed and developing countries also is measured based on the contribution of research and development in their various economic, social and political activities. Scientific approach to the different problems of economic, political and social is the origin of research and development and will be a solution for many problems in this field (Rezaei, 2012).

Advanced technologies play an important role in the modern economy. This is an important factor for economic growth and a vital factor in determining competitiveness of companies in national and international markets and R&D is widely known as a center of high technology and the level and rate of costs growth is considered as confident indicator for the innovative capacities (Rezaei, 2012).

Research and development expenditures is discussed when basic or applied research use to provide new product or improve present product so that strengthen its competitive position in the market and any benefits from these activities will be received in the future. But in most cases, there is so uncertainty about the future benefits. Will new or improved product be more effective competitor in the market? Will the firm’s earnings increase as a result of research and development activities? Over what period increase in profit will be observed? (Foladi 2006).

Research and development costs are two types in the companies: companies which convert Research and development costs into capital and companies which cost it that in comparison, the companies which convert Research and development costs into capital perform more successful in forecast of future earnings than the second group of companies. Proponents of the first approach believe that converting into capital enables management to transfer better information about the success of projects and future probable profits (Zavari, 2009).

The relationship between converting the cost of research and development into the capital and the informational content of stock prices is important for both academics and policy makers of accounting major and capital markets, because this relationship pays to the issues related to what is important in accounting (Zavari, 2009).
Converting Research and development costs into capital, by providing information about the amount of costs that have been converted into capital and also the amortization period of these costs provide this possibility for the management of company that transfers information about the success of projects and their future probable profits to users in better form. This information is not disclosed by converting the research and development cost into capital, therefore, converting research and development cost into capital can cause that the stock price has more informational content (Zavari, 2009). Among the users of accounting information, the investors are considered the most important beneficiaries. Accordingly, the accounting information should help investors to predict future events. Interested investors seek to maximize their return on investment (Moses Rezaei, 2012). For this reason, the issue of investigating the effect of research and development costs on future returns and earnings forecast in the listed companies in the Tehran Stock Exchange was selected so that effective solutions by presenting appropriate recommendations to investors for obtaining maximum return and maximum profit at the same times through empirical research and scientific tests conducted on occurred information during many years in the Tehran Stock Exchange is provided. This study thus help to the decision making of investors and shareholders for trading in the stock market of Tehran Stock Exchange.

Research background

Nakayo (1993) investigated the relationship between variables of market share, R&D costs, advertising and profitability in the manufacturing industries in Japan using simultaneous equations system. The results show that increase in the quality of firms' products has resulted in increase in market share and profitability of industries. Dalrez (2003) investigated the importance of R&D investment on improvement in efficiency of British industries for 1997-70 time period about eight factory industries. Based on the results, there is a significant and positive relationship between R&D activities and efficiency of industries.

Kim and Young Lee (2008) in their study investigated the relationship between variables of Research and development costs and market share in the form of testing Schumpeter's hypothesis. In their study, using the optimal control approach they concluded that there was significant relationship between variables of process innovation and innovation in the product’s manufacture with market share.

Donelson and Resutek (2012) investigated the effect of R&D in future returns and profit forecast. The research results showed that there is significant and positive relationship between future returns and R&D and also positive relationship between future earnings and pure R&D.

Mojtahedzadeh et al. (2007) investigated the relationship between earnings management and future returns of assets and future operating cash flows. To test the hypotheses was used the Gani model (2005). The statistical universe is manufacturing companies listed in Tehran Stock Exchange during the years 2001 to 2006. The results showed that there is no significant relationship between the future returns on assets and future operating cash flows and earnings management.

Nazary, Mobarok (2010) in a study investigated the effect of R&D investment on productivity in Iran industries. The main objective of this article is to investigate the role of research and development costs on increase in total productivity. Production factors in double-digit codes level of industries for 9 industrial activities during the years from 1995 to 2008 is used. The results of the study indicate that during the study period, skilled human capital, capital to output ratio, profitability, share of foreign consumption materials, openness of economy, private ownership, exchange rate with two lags and the research and development costs with three lags have positive effect on total productivity of manufacture factors in various industries that the greatest effect was for the share of private ownership. Greatest effect of R&D costs in the productivity is related to chemical products, petroleum, rubber, plastic and metal factory products, machinery and equipment.

Komeyjany and Memarnezhad (2004) released an article entitled the importance of manpower quality and R&D in Iran economical growth. In this article in addition to introduce one of the endogenous economical growth models that is growth model with endogenous technological change from Romer (1990) built a model for Iran economical growth and evaluate the positive impact of manpower, physical capital, revenues from oil exports, negative effect of inflation and the dummy variable related to the Islamic Revolution based on the conducted test with the (Autoregressive Distributed Lag) approach (ARDL), however significant relationship between the R&D variable and non-petroleum exports with economical growth in studied period was not observed (1958 -
1999) due to the low volume of R&D costs and also low ratio of non-petroleum exports to GNP and its traditional and non-factory structure.

Dehghani and Kheradmand (2005) in a study evaluated the impact of research and development costs on the profitability in Iran's industries in which they investigated the effectiveness of research and development costs in Iran's industries and production cooperatives of Khorasan Razavi province. In this study, they used data from the 22 4-digit industry codes during year 2000. Based on the results from estimating the model, a significant and positive relationship between the research and development costs in Iran's industries and production cooperatives of Khorasan Razavi province in mentioned years is approved.

Research hypotheses

The present study investigates this question that: whether the research and development costs have effect on future returns and profit forecast of listed companies in Tehran Stock Exchange or not and if they have effect, how is it? Therefore, the following hypotheses are formulated:

**First hypothesis:** There is significant relationship between the research and development costs and earnings forecasts in the listed companies in the Tehran Stock Exchange.

**Second hypothesis:** There is significant relationship between the research and development costs and future returns of listed companies in Tehran Stock Exchange.

Research Methodology

**Statistical universe and sample**

Statistical universe of this study includes all the listed companies in Tehran Stock Exchange. Statistical sample used in this study consists of companies which are related to the time period 2009 to 2012 and have the following conditions:

1. The companies that entered to the stock before 2009 and were active in stock until the end of 2012.
2. The companies that their financial period has not changed during the studied period and the end of their fiscal year lead up to December 31.
3. They should not be among investment companies or financial intermediary such as bank and insurance.

Among the companies which have above conditions, 45 companies has been selected randomly.

**Method of data analysis and hypotheses testing**

The present study is descriptive-correlation in terms of the nature and method and is application in terms of purpose. The statistical models used in this study are multivariate regression model and compilation data method was used for estimating regression models. In this method, time series and cross-sectional data are combined with each other. To appropriate estimate of models are used one of the methods of common effects, fixed effects and random effects. First, F-Limer test is used to select among the common effects and fixed effects methods and its hypotheses are as follows:

- **H0:** Common Effect Model
- **H1:** Fixed Effect Model

If the hypothesis H0 is confirmed, models are estimated using the common effects method. But if the hypothesis H1 is confirmed, one of the fixed effects and random effects methods are selected to estimate regression models using the Hausman test. Hausman test hypotheses are as follows:

- **H0:** Random Effect Model
- **H1:** Fixed Effect Model

In this study, to investigate the independence of the errors of the regression model is used Durbin-Watson test (DW) and to accept or reject the research hypotheses is used t student test.
The model used to test the research hypothesis

In order to test the research hypotheses is used the following models:

**future returns model**

\[
FR_{it} = \beta_0 + \beta_1 RD_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \varepsilon_{it}
\]

In this model:
- FR = indicative of future returns
- RD = Research and development cost
- SIZE = indicative of firm size
- LEV = indicative of financial leverage

**profit forecast model**

\[
EF_{it} = \beta_0 + \beta_1 RD_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \varepsilon_{it}
\]

In this model:
- EF = indicative of earnings forecasts

And the remaining variables are similar to the future returns model.

### Table 1. Research variables and how they are calculated

<table>
<thead>
<tr>
<th>variables</th>
<th>type of variables</th>
<th>measurement method</th>
</tr>
</thead>
<tbody>
<tr>
<td>future stock returns</td>
<td>dependent</td>
<td>(stock market price at the end of next year - stock market price at the beginning of next year + dividend of next year) divided by the stock market price at the beginning of next year</td>
</tr>
<tr>
<td>predicted EPS</td>
<td>dependent</td>
<td>predicted earnings announced by companies</td>
</tr>
<tr>
<td>Research and development cost</td>
<td>independent</td>
<td>Research and development costs on net sales</td>
</tr>
<tr>
<td>Financial leverage</td>
<td>control</td>
<td>total debt divided by total assets</td>
</tr>
<tr>
<td>firm size</td>
<td>control</td>
<td>Natural logarithm of total asset</td>
</tr>
</tbody>
</table>

The research findings

**Statistical tests**

As can be seen from the results of Table 2, the p-value amounts of F-limer statistic for first and second models respectively are 0.0242 and 0.0000. As a result, estimation method of compilation data (common effects method) will be rejected. Results obtained from F-limer tests have shown that common effects method is not appropriate to estimate the regression models. Therefore, Hausman test is done to select the appropriate method of estimation for both models. The p-value amounts of Hausman statistic also indicates that the fixed effects model is more appropriate option to estimate the model.

### Table 2. Results of F-Limer test and Hausman test

<table>
<thead>
<tr>
<th>Model</th>
<th>tests</th>
<th>test statistic</th>
<th>degrees of freedom</th>
<th>p-value</th>
<th>test result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F-Limer test</td>
<td>1.5359</td>
<td>44.222</td>
<td>0.0242</td>
<td>fixed effects method</td>
</tr>
<tr>
<td></td>
<td>Hausman test</td>
<td>25.8722</td>
<td>3</td>
<td>0.0000</td>
<td>fixed effects method</td>
</tr>
<tr>
<td>2</td>
<td>F-Limer test</td>
<td>4.6270</td>
<td>44.222</td>
<td>0.0000</td>
<td>fixed effects method</td>
</tr>
<tr>
<td></td>
<td>Hausman</td>
<td>16.3737</td>
<td>3</td>
<td>0.0010</td>
<td>fixed effects method</td>
</tr>
</tbody>
</table>
Test results of the research hypotheses

Test results of the first hypothesis

Fitting results of the first research regression model, which is conducted using fixed effects method, are presented in Table 3. P-value of F-Fisher statistic is equal to 0.0000 and reflects the overall adequacy of the model. Adjusted $R^2$ is equal to 0.2615 and suggests that more than 26% changes in the dependent variable (future returns) are explained by the independent and control variables of research. Durbin-Watson test (2.1545) indicates that there is no autocorrelation in the error component of model.

The first research hypothesis states that there is significant relationship between the research and development costs and future returns. As it is observed from the results of Table 3, variable of Research and development cost has -0.1961 coefficient and 0.8929 significance level and given to the error level more than 5% for mentioned variable, can be expressed that there is no significant relationship between research and development costs and future returns. Thus, the first research hypothesis cannot be confirmed.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>t-statistics</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-11.4109</td>
<td>-5.8616</td>
<td>0.0000</td>
</tr>
<tr>
<td>RD</td>
<td>-0.1961</td>
<td>-0.1348</td>
<td>0.8929</td>
</tr>
<tr>
<td>SIZE</td>
<td>0.8670</td>
<td>5.9797</td>
<td>0.0000</td>
</tr>
<tr>
<td>LEV</td>
<td>0.5447</td>
<td>2.8556</td>
<td>0.0047</td>
</tr>
</tbody>
</table>

Table 3: Estimation results of the first regression model

Test results of the second hypothesis

Fitting results of the second research regression model, which is conducted using fixed effects method, are presented in Table 4. P-value of F-Fisher statistic is equal to 0.0000 and reflects the overall adequacy of the model. Adjusted $R^2$ is equal to 0.8059 and suggests that more than 80% changes in the dependent variable (expected profits) are explained by the independent and control variables of research. Durbin-Watson test (1.4630) indicates that there is no serial autocorrelation among residual sentences of the second regression model.

The second research hypothesis states that there is significant relationship between the research and development cost and expected profits. As it is observed from the results of Table 4, variable of Research and development cost has -1901.989 coefficient. Given that significance level of this variable is equal to 0.0001 and less than 1% error level, therefore can be expressed that there is negative and significant relationship between research and development cost and expected profits. Thus the second research hypothesis is confirmed.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>t-statistics</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-588.7243</td>
<td>-1.1491</td>
<td>0.2517</td>
</tr>
<tr>
<td>RD</td>
<td>-1901.989</td>
<td>-4.1002</td>
<td>0.0001</td>
</tr>
<tr>
<td>SIZE</td>
<td>147.7253</td>
<td>3.5166</td>
<td>0.0005</td>
</tr>
<tr>
<td>LEV</td>
<td>-1158.786</td>
<td>-8.1590</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Table 4: Estimation results of the second regression model
Conclusion

This study sought to investigate the effect of R&D costs on future returns and expected profits. Therefore, using panel data regression, we used the sample consisted of 45 companies which they were active in Tehran stock exchange from the year 2007 to 2012. The findings of the first research hypothesis indicate that there is no significant relationship between future returns and research and development costs. The findings of this research are similar to the research findings of Mojtahedzadeh et al. (2007). Research and development costs require training and doing appropriate procedures and planning for increase in returns in the long-term, if this affairs does not make appropriately, it may also lead to decrease in the future returns of the company. The test results of the second research hypothesis states that there is negative and significant relationship between profits forecast and research and development costs. The findings of this research are similar to the research findings of Nakayo (1993). Nakayo using simultaneous equations system investigated the relationship between variables of market share, Research and development costs, advertising and profitability in the manufacturing industries of Japan. The results of this study show that increasing the quality of firms' products has resulted in increasing the market share and profitability of industries that the results of his study are similar to the present study, because as we discussed Research and development costs lead to increase efficiency of human activities and increase the competitive power in overseas and markets of neighbor countries which in turn will lead to increase profitability.

References

Rezaei, R. (2012). Evaluating global indicators of research and development. From site files.spac.ir