



# Evaluating the relationship between investor sentiment and investment in R&D expenditure in companies listed in Tehran Stock Exchange, and the impact of CEO's duality on the relationship

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**Abstract:** *The study aimed to investigate the relationship between behavioral trend investors and investment in R&D expenditure of companies listed in Tehran Stock Exchange and the impact of CEO's duality on this relationship. This study is a casual and analytical and library survey, and based on analysis of panel data (panel data). The 134 financial companies' data listed in the Tehran Stock Exchange was examined during 2008 and 2014. The results showed that the CEO's duality has a direct significant impact on the behavioral trend of investors and investment in expenditure on research and development of companies listed in Tehran Stock Exchange.*

**Keywords:** *behavioral tendency in investment, investment in research and development expenditure, CEO' duality*

## INTRODUCTION

The financial problems is one of the studies expanded in this field rapidly and examines the process of decision making by the investors and their reaction to different conditions of financial markets and emphasizes more on the influence of emotions, personality, culture and investors' judgments on the investment decisions. The behavioral finance perspective suggests that some of the changes in stock prices have no fundamental reason and investor's sentiment tendency play an important role in determining the price (He et al., 2012). In fact, the dynamic interplay between distortionary traders and reasonable arbitragers would form the prices and if a one share is proponed by more distortionary traders and lower reasonable traders, the price volatility is impressive. The behavioral finance subject represents two basic hypotheses: the first hypothesis includes the investors make decisions under affecting their sentiment orientation. Here sentiment orientation as belief in future cash flows and investment risks is defined by the belief in future liquidity flows and investment risks which is not created by the facts available. The second hypothesis is that the arbitrage is a costly risky behavior versus the investors (Shahrabadi and Yousefi, 2010). In a large study it was presented at strong corporate-governance companies which enjoy higher research and development expenditure is of greater efficiency (Chan et al., 2014). Today the amount of activity in marketing research and development to determine market price of the company's stock is very effective, so that based on the research carried out, a stopped part of the research and development activities is a negative psychological effect on the market price of company stocks that it is especially detrimental for companies confronting to a growing stock market, small companies as well as low operating cash flows companies (Pascal et al., 2010). According to research by some researchers such as Lee did in 2011, if the company wants to invest in research and development projects, opportunities for growth of company will increase and will earn more stock returns. Several studies have shown that the companies with significant increases in their capital expenditure did encounter with less risk of stock returns and also this negative relationship is getting severe in the companies facing with largely investing (Titman et al., 2004). The study aimed to investigate the relationship between investor sentiment and investment in research and development expenditure of the companies listed in Tehran Stock Exchange and impact of CEO's duality on this relationship.

## **2- Theoretical fundamentals**

### **2-1- Investors' behavioral tendency**

Subgenre issues in the field of finance and behavioral finance debate include studies of how investors to make decision and designing and explaining the decision-making pattern in capital markets, in conditions of uncertainty. The first studies on the behavior of investors in the capital market go back to the '70s. Cohen et al (1975) presented an empirical evidence of reduced risk aversion among individuals while increasing their wealth in the world valid stock markets. Also, Riley and Chu (1992) found that there is a significant relationship between the risk aversion among individuals and their age, income, wealth and education. By increasing income, wealth and education, the risk-taking degree also increases. But there is an inverse relationship between age and risk-taking of individuals. LeBron, Farrell and Gela's studies (1992) proved that the degree of risk aversion among individuals is a function of one's internal considerations, but not external not of market external consideration. The behavioral finance factor is to introduce sentiment orientation of the investors in the decision making process (Miller, 1986). The behavioral finance perspective suggests that some of the changes in stock prices had no fundamental reason and investor's sentiment tendency play an important role in determining prices (Kim and all, 2014). Much work examines the role of investors' behavioral tendency in the stock market, while the traditional theories did not consider the investors' behavioral tendency as a factor influencing the stock returns. Shefrin and Statesman (2009) showed that the behavioral tendency of investor is a factor affecting the stock prices. However, Chang (2015) in their research showed that the investors' behavioral tendency would influence on the profitability, stock price and the dividend policy so that changes in the investor sentiment' lead to a change in profit (Chang, 2015). So, Bradshaw et al (2014) examined the relationship between the sentiment tendencies of investors and reduced their stock price risk. According to the analyses, the results showed a significant relationship between the investors' sentiment tendencies and the reduced stock price risk. Habib (2014) explores the relationship between a firm life cycle and risk-taking and investors' sentiment tendencies. According to the analyses, the results showed that the company's risk taking is different throughout the life cycle. Yin and Tian (2015) examines the relationship between the investors' sentiment tendency and risk of the stock price decline. The results showed that sentiment tendencies of investors were positively associated with future stock price decline. Hamraz et al (2016) examined the relationship between life cycle and sentiment tendencies of investors and risk of stock price decline in the company.

### **2-2- Expenditure on research and development**

There are several observations and experiences which indicate a positive relationship between R&D expenditure and developed efficiency of future operations. This is confirmed by regression between current profit and loss figures and the value of R&D expenditure. Sugi (2013) found that reported profit and loss after adjusting resulting from R&D costs reflects the benefits of these expenditures. Whatever good or bad news about net profit survive more in the future, the reaction coefficient against net profit increase. Therefore, if the current good news is declared due to the successful launch of a new product or intense action done by director to reduce the costs, compared to the extraordinary profit from the sale of a fixed asset, the market will react extremely (Khani et al., 2014). The investors react against disclosing new information affecting their views about the future performance of the company. In general, the good news about a company's performance convinces the investors that the actual price of the shares is lower than the current price, as a result, the demand for the company's shares increases and the stock price is increased. Unfavorable news about the company's performance would ensure the investors that shares of the company were expensively priced relatively to its current price valuation. Some investors sell their stock and the price gets reduced. The effect on the information on demand and supply of investors reflected in the stock price. Each has its own demand and supply condition, so its market price is unique. However, new information about macroeconomic conditions causes the investors to review their expectations from many companies and the stock prices change in the same direction (Khani et al., 2014). Lee (2011) examined the relationship between financial pressure, R&D investment and return on the share. They found that the risk of companies raises that focus on R&D, due to increased financial pressures. As well as risk will raise for the companies are experiencing financial pressure, with a focus on R&D. R&D could predict returns only for the companies that are experiencing the financial pressure, potentially leading to a positive relationship between R&D and efficiency. Hirsch Liffer et al (2013) in research entitled "Investigating a relationship between innovation performance and stock returns" found that efficiency, R&D expenditure are of strong predictor of stock returns given controlling risk and

profiles. The relationship between innovation performance and stock returns is associated with factors reducing the prices.

### 3- Background Research

Grabosky and Muller (2015), based on a cross-sectional analysis, showed that firms' investment in R&D increased the profitability of firms. Then, using the rate of adjusted accounting earnings in form of regression model they showed that firms heavily investing in R&D caught efficiently. Zhou and Huang (2015) in his research on the relationship between CEO's duality, the sentiment tendencies of investors and investments in R&D found that the loss of the stock price arisen from the investors' sentiment tendencies and duality of CEO' duty have a positive impact on the investment in R&D within the companies. Chen (2013) examined the relationship between the sentiment tendency of investors, corporate governance and investment decisions. The sample used in this study includes the companies in Taiwan during the period 2003 to 2010. The empirical results show that the sentiment tendency of investors is significantly positively related to the number of new investors and over investment. Corporate governance also provides the regulatory and motivational effect on the decisions. Grand and Lee (2010) examined the relationship between the sentiment tendency of investors, managers' compensation and investing in the companies. The results indicate that optimism among investors has significantly positively related with the level of investment, but not significantly the managers' compensation. The managerial ownership is positively related with the level of investment and subject to the degree of optimism. Heidarpour et al (2013) examined the impact of sentiment tendency of their investors on the stock returns. The traditional view of stock return holds that the stock price fluctuations are related to systematic movements in the company's core values. But recent research shows that the investor's sentiment tendency plays an important role in determining prices and explaining output time series, especially for the stocks that have higher subjective assessment and a lot of limitation in the arbitrage. Nazari and Moubarak (2012) examined the effect of the R&D investment on the industrial productivity in Iran during 1995 and 2008, the results indicate that in the course of the study, skilled human capital, the ratio of capital to production, productivity, the share of foreign consuming materials, open economy, private ownership, exchange rates under two breaks and the costs of R&D with three breaks have a positive impact on the total productivity of producing factors in various industries that the greatest impact is seen in the share of private property.

### 4- Research methodology

#### 4-1- Hypothesis

- CEO's duality has a significant impact on the relationship between behavioral tendency among investors and investment in expenditure of R&D within the companies listed in Tehran Stock Exchange.

#### 4-2- Statistical sample and population

The study population consisted of all companies listed in Tehran Stock Exchange. According to the official website of the Tehran Stock Exchange by the end of 2014, it includes 520 companies from 37 industrial groups. So in this study, all companies listed in Tehran Stock Exchange over a 7-year period, from 2008 to 2014. In this study, to be an appropriate representative sample of the target population, the screening method (removal) is used for sample selection.

Table 1-1- The sample selection process

Number of companies	Description
514	companies listed in Stock Exchange in 2008
681	companies listed in Stock Exchange in 2016
465	companies listed in Stock Exchange between 2008 and 2016
172	Companies' fiscal year not ended in 19 on March and those with changed the fiscal year.
34	Holding companies, financial broking, insurance and banks ...
125	Companies with financial information incomplete.
134	Companies' data is collected (final sample)

**4-3- Methodology**

In this study, due to finding a significant relationship between the variables as well as the study of changes in the dependent variable given the independent variables' domains, it is a correlative research, and also in terms of nature and content of the research, and to explore the correlation between variables, it will be acted in a casual way. This a research and applied one in terms of type of study and objective that the actual data and different statistical methods are used to reject or not reject the hypotheses, and placed in the field of proof theory.

**4-4- Definition of and how to calculate variables**

**4-4-1- The investors' behavioral tendency**

In this study, to determine the investor sentiment, it was used capital market behavioral tendency (EMSI). The index has been developed by Jones (2005) and by adjusting the model presented by Prsavid (1996). So the investors' behavioral tendency can be calculated using Equation 4:

$$SENT_{pt} = \frac{\sum (R_{it} - \bar{R}_r)(R_{iv} - \bar{R}_v)}{[\sum (R_{it} - \bar{R}_r)^2 \sum (R_{iv} - \bar{R}_v)^2]^{\frac{1}{2}}} \times 100, \quad -100 \leq EMSI \leq +100$$

Where:

R<sub>it</sub> = monthly rank of the company i<sup>th</sup>'s stock efficiency in month t

R<sub>iv</sub> = historic volatility rank of Company i<sup>th</sup> in month t

To calculate historical volatility, the average standard deviation of stock returns of five months is used.

R<sub>r</sub> = monthly average rank of the portfolio company's stock returns

R<sub>v</sub> = monthly average volatility rank of the portfolio company's stock (Heidari, 2012).

**4-4-2- Investment in R&D**

This is a portion of R&D expenditures to total sales ratio (Nazari and Moubarak, 2012 Thomas et al, 2011; Ardouf et al., 2013).

**4-4-3- Duality of CEO**

If CEO is a president of the Board of Directors, consider 1 and otherwise zero (Rahimi, 2015).

**4-4-4- sales growth**

The ratio of current year sales minus last year divided by the last year (Akram, et al., 2010)

**4-5- Data analysis**

In this study, the first episode of descriptive statistics in the form of minimum, maximum, mean and standard deviation is considered to describe the variables. In the second part of the test for heterogeneity of variance, F Limer test, variance homogeneity test, test and Jarek Bera test and Lin-Levin test and regression are used as pre-test and post-test, respectively, to confirm or reject hypotheses.

**5- Results**

**5-1- Jarek Bera test**

Table 1-2 normality tests of variables (Jarek Bera)

Description of parameter	Variable						
	RD	Investment	Investor	Sentiment	CEO duality	Size	Growth
Number	937	937	937	937	937	937	937
Test criterion	0.781	0.714	0.434	0.563	0.725	0.781	0.714
Significance level	0.6	0.08	0.07	0.06	0.06	0.06	0.06

In Table 1.2, given significance level obtained based on this test, as a significant level is greater than 0.05, the distribution of the dependent variable is normal.

**5-2- Evaluation of heterogeneity of variance**

Table 1-3- Test results of variance heterogeneity

Hypo	Description	Statistics	Probability	P-Value	Result	Regression method
1	F-statistic	6.015	0.000	P< 0.05	Variance heterogeneity	Used GLS
	Obs*R-squared	18.144	0.000			

In all hypotheses, given that the test statistic is significant at the 5% level, so the hypothesis of variance homogeneity was rejected and the heterogeneity of disturbing term will be confirmed.

**5-3- F Limer test and Hausman test**

Table 1-4- F Limer test and Hausman test

Hypotheses	F-Limer statistic	Probability	p-value	Result	Huasman statistic	Probability	p-value	Result
1	4.143	0.0454	P<0.05	Panel data	108.477	0.0000	P<0.05	Fixed effect

Since the p-value obtained from F-Limmer test is smaller than 0.05, the null hypothesis is rejected (p-value<0.05) and panel data method will be accepted. Also according to the p-value obtained from the Hausman test less than 0.05, the hypothesis of Hausman test is rejected the fixed effects approach is accepted.

**5-4- Hypothesis testing**

Table 1-5- Result of data analysis to test the hypotheses

Variable	Coefficient	Standard deviation	t-statistic	p-value
c	-0.996	0.714	-5.741	0.000
INVESTORSENTIMENT	-0.002	0.000	-5.808	0.000
CEODUALITY	0.021	0.022	0.924	0.355
CEODUALITY*INVESTORSENTIMENT	0.008	0.000	3.345	0.000
SIZE	0.325	0.031	10.195	0.000
GROWTH	-0.003	0.003	-0.888	0.374
DW		2.143	Adjusted R-squared	
Prob (F-statistic)		0.000	0.158	

According to the results of the regression model as above table, it is observed that the significance level for the F statistic indicating the significance of the total regression is equal to 0.002873 and indicates that the model is placed at significance level of 95%. Adjusted coefficient of determination R<sup>2</sup> was equal to 0.158979 and indicated that approximately 16% of the variability of dependent variable can be explained by independent variables, as well as the Durbin-Watson statistic is 2.143762; the value is between 1.5 and 2.5, which indicates a lack of correlation between variables. As seen in Table 4-6, variable coefficient (CEODUALITY\* INVESTORSENTIMENT) is equal to 0.000856 and its significant number is 0.0009. According to the t- statistic and p-value of this variable, the results showed this coefficient significance at the level of 5%. These findings indicate the CEO's duality has a significant effect on the relationship between the investors' behavioral tenancies and investment in R&D expenditure for the companies listed in Tehran Stock Exchange.

**6- Conclusion and Recommendations**

The results indicate that value of probability of table is less than 5%, therefore, in this period, null hypothesis was rejected under 95% probability and H<sub>1</sub> was accepted. So it can be concluded that the CEO's duality has a significant effect on the relationship between investors' behavioral tendency and investment in R&D expenditure in companies listed in Tehran Stock Exchange. The results are not consistent with findings of Zhao Huang (2015), but of Chen et al (2012). CEO's duality has a significant effect on the relationship between investors' behavioral tendency and investment in R&D expenditure in companies listed in Tehran Stock Exchange which has been accepted, it is suggested a research regarding the relationship between CEO's duality of the relationship between investors' behavioral tendency and investment in R & D expenditure and its impact on corporate credit rating.

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