CAPITAL STRUCTURE, INVESTMENT OPPORTUNITY SET, GROWTH SALES, FIRM SIZE AND FIRM VALUE : R&D INTENSITY AS MEDIATING

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CAPITAL STRUCTURE, INVESTMENT OPPORTUNITY SET, GROWTH SALES, FIRM SIZE AND FIRM VALUE : R&D INTENSITY AS MEDIATING

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Abstract

This research aimed to develop a theoretical approach as a mean to improve company value. The effort done were involving capital structure, investment opportunity set, sales growth, and company size, also proposing a research and development as an intervening variable so that to build a grand theoretical model. The population of this research was manufacture companies registered in Indonesia Stock Exchange during observation period from 2007 to 2015. Path analysis was used as a mean of analysis helped by AMOS program. The main finding was R&D intensity which is the mediation between the effect of debt to equity ratio and capital expenditure to book value of assets to to tobin's q value. Debt equity ratio ot shown to have indirect influence on to tobin's q positive value through R&D intensity. While R&D intensity did not mediate the effect of capital expenditure to book value of assets, and sales growth rate against to tobin's q . The result showed R&D intensity and sales growth gave positive and no significant effect on to tobin's q value, while debt to equity ratio gave negative and significant effect on to tobin's q value, capital expenditure to book value of assets gave negative ang no significant effect to to tobin's q value. Meanwhile, debt to equity ratio gave positive and no significant effect on R&D intensity, and capital expenditure to book value of assets and sales growth did not influence the R&D intensity.

Keywords: *firm value, firm size, sales growth, Investment opportunity set, capital structure, research and development*.

1. Introduction

Agency theory describes the relationship between management and stakeholders (agent and principal), a manager must decide the best thing to improve the wealth of stakeholders. The decision is to maximize the resources (utility) of the firm. The de on of funding through capital structure can reduce the agency conflict because free cash flow of the firm sent to the account of debt payment. the importance of funding in the form of capital structure factor of firm to produce assets, run the operational things, and improve the development of the firm (Thippayana, 2014).

The value of the firm is the sum of debt and equity based on market value (Weston and Copeland, 1992). The raise of firm value is an achievement that is suitable with the desire of the owners, because it leads to the raise of wealth of the owners, and it is the manager's duty as the agent who is trusted by the owners to run the firm. A manager's decision influences the optimal result in in order to increase value for the company. Therefore, a managers must be able to make decisions effectively to raise the firm value.

The optimization of a firm value can be reached by running the function of financial management, where one decision taken will influence others and firm value (Fama & French, 2007). The management includes the solving of important decisions taken by the firm; such as, funding decision, investment decision, and dividend policy. If the purpose is to maximize the firm value, the firm must choose the *debt equity ratio* resulting the maximum firm value. This maximum value must provide big profit to the stakeholders.

The financial decision is very important and integral parts of financial management in every firm. A good decision must consider the scope of capital structure, capitalization, and capital cost. Capital structure is a significant thing for management because it affects the mix of debt and equity of the firm which influences the return of stakeholders and risk. So, deciding the debt combination and equity plays main role in the part of firm value and stock market value. Based on the theory of *trade-off* (DeAngelo & Masulis, 1980; Fama, Eugene F. and Miller, 1972; Jensen, 1986; Myers, 1977) the choice of firm funding reflects the effort of the manager to balance the tax-shield from bigger debt by improving the possibility of financial distress cost. The use of debt is another mechanism used for reducing or controlling the agency conflict (Jensen & Meckling, 1976). The company's capital structure explains how the company increases the capital needed to build and expand its business. It consists of various types of capital and debt capital maintained by the company resulting from the company's financing decisions. In one way or another, business activities must be funded. In all aspects of capital investment decisions, capital structure decisions are vital because the company's profitability is directly affected by the decision (Claude, 2016).

2. Literature review and hypothesis development

Normatively, the aim of financial management in to improve the firm value, reflected by the stock market value (Fama, 1978). Improving the firm value means maximizing the rich or prosperity of the stakeholders. The management of finance is related to an important decision taken by firm and a combination from funding decision, investment decision, and dividend policy of maximizing firm value (Mbodja & Mukherjee, 1994). IOS is the availability of alternative investment in the future for the firm. IOS is the current value of firm's choices to make investment in the future (Chung, Wright, & Charoenwong, 1998). Investment decisions are a combination of ownership of assets (assets in place) and various future choices about investment with a positive net present value (Myers, 1977). IOS gives wider

clue where firm value depends on the expenses in the future. So the prospect of the firm can be estimated from IOS.

Studies on firm value sometimes can not be removed from the size of firm. There is tendency that large companies easier to enhance corporate value. A big firm has more accurate estimation on profit, it is because it has various business lines and wider market. Besides, big companies have more resources to improve the firm value because they have better access to external information sources than those of small ones. Ota (2003) showed that a manager form big companies have strong commitment on profit estimation. Dastgir et al. (2007) explained that big companies have greater control on market situation, so they can face the competition resulting in less affected by economic fluctuation. Mudambi & Swift (2011) explained that big firm, R&D expenses and the level of firm's development have strong relationship, while for a small firm the relationship is weak. Klette & Griliches (2000) presented the quality of firm's development level model where the investment of R&D and sistochastic innovation is the machine of growth. Qiao, Ju, & Fung (2014) the results of the study show that the existence of R&D and technology have positive and significant effect to the innovation of SMEs. The most important finding is that innovation at SME gives have a positive impact firm's performance. Zhu & Huang (2012) described the innovation technology and R&D are the core of business strategy of a firm to compete in market. The research done was to test the relationship between investment and the intensity of R&D and the firm's performance in China to show result that companies with intensive investment on R&D would have higher finance performance than the previous year. Chun et al. (2014) emphasizes the importance of R&D investment to support the long-term development of the firm. Li (2011) stated that there is a strong related financial constraint, R&D intensity, and stock return. R&D intensity can predict and operate stock return of the firm to the positive direction.

2.1. Hypotheses for capital structure and firm value

Describe the purpose of the management to maximize the value of capital market and obligation market, so the firm can determine the maximum total amount which becomes the value of the firm. Jensen & Meckling (1976), also describe that manager's decision to determine the capital of structure is to keep the balance of obligation with the firm's own money, and minimize the effect given by those to the value of the firm. DeAngelo & Masulis (1980) explain that in the *static trade off theory*, structure of optimal capital happens because of the process of trade-off between *tax shield of leverage cost of financial distress and agency cost of leverage*. The decision of funding taken by the firm influences the firm performance positively (Claude, 2016). The similar result but with emphasis on there is maximum level so the capital can improve the value of the firm (Nieh et al., 2008). Meanwhile, Ruan et al. (2011) showed that the ownership of managerial influences the capital structure and finally the firm value. Berger & Bonaccorsi di Patti (2006) proved that both high leverage of a firm and low equity level have significant effect to improve the performance of the firm economically and statistically.

H1. Debt to equity ratio has a positive impact on to tobin's q

2.2.Hypotheses for investment opportunity set and firm value

Myers (1977) explained that firm value is not determined by the debt proportion but it is determined by the combination from investment opportunity set and placed asset. IOS is determined by th choice where the business line is based on the competitive excellence, so the value of the firm is determined by the expenses arranged by the management in the future, which are the investment that is seen to give greater profit (Gaver & Gaver, 1993; Smith & Watts, 1992). Yuliani et al. (2012) got the result tha here is direct positive and significant effect to firm value. increased investment will have an impact on increasing the value of the company. Wright & Ferris (1997) who did the research in Africa defined that investment dcision through divestment affects the f value.

H2. Capital expenditure to book value of assets has a positive impact on to tobin's q

2.3.Hypotheses for sales growth and firm value

Lang et al. (1996) explained that the growth of a firm has negative relationship with leverage but it has positive one with firm value (T tobin's q), whereas for companies with high growth opportunities, the debt ratio has a negative impact on the value of the company. Therefore, the effect of capital on firm value really depends on the chance of growth. However, Lee (2014) clearly found out that there is positive effect given by company growth to profitability. Furthermore, Lee explained that the environment of the compa has strong effect on the relationship between company growth and profit. The development of technology is also an imp nt factor to increase the company value (Y. S. Chen & Chang, 2010).

H3. Sales growth has a positive impact on to tobin's q

2.4.Hypotheses for Firm size and firm value

Nyoman et al. (2014) found that firm size has positive and significant effect on firm value in manufacture sector in Indonesia. Moeljadi (2014) stated that big firm can increase the value of manufacture firm that is why it generally is a big firm. Gedajlovic and Shapiro (1998) find the size of the company has an impact on e profitability of the results positive. Khodamipour et al. (2013) the study found that there was a significant relationship betw n stock risk and the size of the company against stock returns, also b ween the size of the company and the value of the company. A gnificant and direct relationship between market value and liquidity volume and re is also a positive and significant relationship between liquidity volume and st k returns. This also supported by Mule et al. (2015) who showed that firm size does not have any significant effect statistically on market value of the firm. Their study showed that firm size does not have any effect on performance. Nguyen et al. (2015) explained that in Australia, company size does not have a gnificant effect on firm value.

H4. Firm size has a positive impact on to tobin's q

2.5.Hypotheses for R&D and firm value

Gharbi et al. (2014) emphasize the importance of investment in R&D for a firm, because R&D becomes one of these policies that are able to overcome asymmetric information, thus causing a relationship between investment in R&D and profit volatility for stakeholders is very high and positive. This is considered rational because investment in R&D pushes the manufacture firms to develop new products to compete in developing countries (Eng & Ozdemir, 2014). Garner et al. (2002) showed that the speed of firm innovation proxy by R&D investment is the determiner and important factor of firm value. Qiao et al. (2014) found that innovation in SME has positive effect on firm performance. Hashi & Stojčić (2013) tested the effect if innovation on firm performance and found that there is positive relationship between innovation and productivity. Investment in innovation is an absolute thing to win the competition, and in big firms investment in innovation will be more than in small firms. While based on King & Santor (2007) the investment in innovation done by the firms does not explain how it works significantly.

H6. R&D Intensity has a positive impact on to tobin's q

2.6.Hypotheses for capital structure and R&D

Thippayana (2014) in his review found that capital structure is an important factor for a firm to produce assets, to operate the firm, and to improve the growth in the future that leads to maximize the firm value. The leverage improvement can improve the firm size but can reduce the profitability significantly. Other study done by Kale & Shahrur (2007) found that firm leverage has negative relationship with the intensity of R&D from suppliers and customers.

H7. Debt to equity ratio has a positive impact on R&D Intensity

2.7.Hypotheses for investment opportunity set and R&D

Investment decision taken by firms can be applied in many fields; one of them is technology. The dynamic and competitive business environment that always evolves demands firms to always follow the development of technology and apply it in productivity activity at firms. Yildizet al. (2013) tested the relationship between innovation performance and technology investment that gives the result of strong relationship in techno-polis firms in METU (*Middle East Technical University*) and *Hacettepe University* in Turkey. In multinational company, investment in R&D in parent company will give motivation used as base of investment in foreign market as a multinational firm and later will expand the firm size. Investment in technology for foreign market and continuous R&D in parent company is a strategy done by multinational company to penetrate the market (Huang, 2015).

H8. Capital expenditure to book value of assets has a positive impact on R&D Intensity

2.8.Hypotheses for growth sales and R&D

Goedhuys & Veugelers (2012) explained that innovation strategy in the form of internal development or external acquisition has effect on the success of a process and product innovation. This thing then explores the importance of process and product innovation in terms of firm growth. The success of innovation is mainly through the purchase of machines and equipment. Innovative performance is the main booster of firm growth, especially combination from products and innovation process that significantly raise the firm growth.

H9. Growth sales has a positive impact on R&D Intensity

3. Research methodology

This section is devoted to discuss the data sources, sampling design and the empirical model tested in this study.

3.1.Data collection and sources

The type of data used is quantitative ones gathered from; (1) *Indonesian Capital Marker Directory* (ICMD), published in 2008-2016; (2) Annual report. Based on time dimension and order of time, this research is a cross-sectional and time series or known as data panel (data pooled). The sample firms are those which have R&D expenses, including *research and development* (R&D) cost, education and training, and human resources development. The data of the firms used as population are 220 manufacture firms in 9 years.

Table 1. Research Data Collection Process

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015
The number of manufacture firms registere in Indonesia Stock Exchange									
	141	139	134	135	139	138	141	143	143
The number of manufacture firms expensing R&D based on PSAK 19									
	23	23	24	24	25	29	28	22	22
The number of manufacture firms used as data of research									
	13	13	15	13	16	18	18	12	17

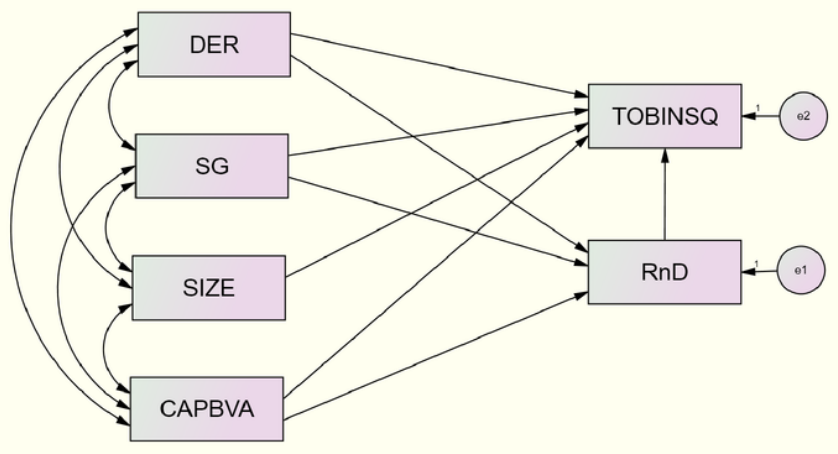
Authors' tabulation

Table 1 showed the process of qualified samples gathering and the result is there are 135 manufacture firms.

3.2.Empirical model and variables measurement

The research was focused on the empirical test of variables integration related to the firm value involving capital, IOS, growth of sales, and firm size mediated by R&D. The model of empirical study presented in picture 1.

Picture1. Empirical model



Both sub structure formed in picture 1 are; **First,** sub structure shows the causal relationship between variables DER, CAPBVA, and SG with Variable R&D; **Second,** sub-structure stated causal relationship of variables DER, CAPBVA, SG, LNTA, and R&D with TO TOBIN'S Q variable. In other words, based on both sub-structures, there are 2 structural equations formed :

$$TOBINSQ = \beta_{1\text{TOBINS}'Q}DER + \beta_{2\text{TOBINS}'Q}CAPBVA + \beta_{3\text{TOBINS}'Q}SG +$$

$$\beta_{4\text{TOBINS}'Q}LNTA + \beta_{5\text{TOBINS}'Q}R\&D + \varepsilon_1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1.1)$$

$$R\&D = \beta_{1\text{R\&D}}DER + \beta_{2\text{R\&D}}CAPBVA + \beta_{3\text{R\&D}}SG + \beta_{4\text{R\&D}}LNTA + \varepsilon_1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1.2)$$

Tobin's q is an indicator of firm value showing the performance of management in managing the firm's assets to measure the performance of the firm from the side of potential market value of a firm (Dushnitsky & Lenox, 2006). Research and development uses the measurement from the intensity of R&D where total expenses of R&D divided by total assets of the firm (Chun et al., 2014; Li, 2011; Zhu & Huang, 2012). *Debt to Equity Ratio* is an effort to show, in other format, relative proportion of lenders claim on ownership right, and used as measurement of debt role as an indicator of capital structure (Cheng, Liu, & Chien, 2010; Cuong & Canh, 2012). Factual approach chosen for investment opportunity set was *CAPBVA* (Assih, n.d.; Yuliani et al., 2012). The sales growth is the ratio of sales change divided by previous year sales (Dunne & Hughes, 1994). The firm size measured with natural logarithm of total assets (Chen & Chen, 2011; Dastgir, et al., 2007; Fosu, 2013; Hou Loi & Khan, 2012; and King & Santor, 2007).

Table 2. Summary of the variables

Variable	Name of the variable	Operationalization	Expected sign
To tobin's q	Firm Value	Market value of total stock circulating and debts divided by total assets	
R&D Intensity	Research and Development	Total expenses of R&D divided by total assets.	+
DER	Capital Structure	The ratio of total debts owned by firms to total equity.	+
GS	Growth sales	The change of total sales divided by sales.	+
CAPBVA	Investment opportunity set	The change of total assets divided by total assets.	+

A descriptive statistics for variables are shown in Table 3. On average, the to tobin's q data in Indonesia reach 1.58 with the highest to tobin's q value is 4.29 and the lowest is 0.32. While for DER, the average is 0.75 x with the highest DER is 2.46 x and the lowest is 0.13 x.

Table 3. Descriptive statistics.

Variable	Mean	Standard deviation	Minimum	Maximum
TOBINSQ	1.585868	0.9805761	0.3287	4.2910
DER	0.749804	0.5627829	0.1303	2.4622
SIZE	14.433604	1.3743705	11.4633	17.4571
R&D	0.203063	0.2013488	0.0004	1.0699
CAPBVA	2.976867	4.1777410	-5.1816	14.3366
SG	13.134267	16.9291991	-29.0057	72.3977

Table 4 about the Pearson correlation matrix and the Vector Inflation Factor (VIF) variable. The results obtained are the variables farthest from the correlated ones. The high correlation coefficient is 73.10% ie size and tobin's q with the results of a positive and significant correlation. While the closest correlation is 1.00% between size and DER which shows a positive but significant correlation.

Table 4 Pearson correlation matrix.

VARIABLES	TOBINSQ	DER	SIZE	CAPBVA	R&D	SG
TOBINSQ	1					
DER	-.197*	1				
SIZE	.731**	.010	1			
CAPBVA	.306**	.035	.453**	1		
R&D	-.050	-.012	-.088	-.192*	1	
SG	.095	.214*	.165	.151	-.114	1

4. Empirical findings

Initially, we estimate the path analysis using AMOS, results in Table 5.

TABLE. 5
OUTPUT PATH ANALYSIS

			Estimate	S.E.	C.R.	P	Label
RnD	<---	DER	.005	.031	.153	.878	par_12
RnD	<---	CAPBVA	-.009	.004	-2.101	.036	par_13
RnD	<---	SG	-.001	.001	-1.026	.305	par_14
TOBINSQ	<---	SIZE	.529	.045	11.693	***	par_4
TOBINSQ	<---	SG	.001	.003	.375	.708	par_5
TOBINSQ	<---	DER	-.363	.100	-3.627	***	par_6
TOBINSQ	<---	R&D	.054	.280	.195	.846	par_7
TOBINSQ	<---	CAPBVA	-.006	.015	-.373	.709	par_11

From table 5, there are two standardized structural equation formed;

TO TOBIN'S Q = 0.054 R&D -0.363DER -0.006 CAPBVA + 0.001SG + 0.529LNTA……..(1.3)
P (0.846) (0.000) (0.709) (0.708) (0.000)
Cr (0.195) (-3.627) (-0.373) (0.375) (11.693)

R&D = 0.005 DER – 0.009 CAPBVA – 0.001 SG……..(1.4)
P (0.878) (0.036) (0.305)
Cr (0.153) (-2.101) (-1.026)

Based on the structural equation 1.3, the test result of hypothesis, 'the influence of debt to equity ratio to to tobin's q is negative and significantly influence'. Debt to equity ratio which became samples in this research has influence of improving firm value if the debt to equity ratio decreases. This result supports the one done by Modigliani and Miller (1958); Chung et al. (2013); Zeitun, R. and Tian, G. G. (2007); and Cheng, et al. (2010). But it is inconsistent with researches done by Claude (2016); Nieh et al. (2008); Ruan et al. (2011); and Berger and Di Patti (2006).

The influence of CAPBVA to to tobin's q is negative but no significant effect. So, CAPBVA has less meaning to descreases to tobin's q value of firm. SanMartin-Reyna & Durán-Encalada (2012) explained that with the investment opportunities the funding policy the company has a negative correlation to the value of the company, on the contrary if there are no investment opportunities in the relationship between leverage the value of the company is positive. It confirms that

the relationship between investment opportunities with the company's value is negative.

This study is inconsistent with Gaver & Gaver, 1993; Myers, 1977; and Smith & Watts, 1961, stated that firm value is determined by IOS. Adiputra (2016), explains that the influence of Investment Opportunity Set (IOS) on the firm value is positive and significant influence in the ASEAN 5 countries.

The influence of sales growth to to tobin's q is positive but no significant. This study supports Cuong & Canh, 2012; Gedajlovic, Eric D. and Shapiro, 1998; Khorrami et al., 2013; Moeljadi, 2014; and Mule et al., 2015. But it is inconsistent with Lang et al., 1996; and Lee, 2014. The influence of firm size to tobins' is positive and significant

The influence of R&D to to tobin's q is positive but no significant. This goes along with the research by Gharbi et al. (2014) emphasizing the importance of investment in R&D in a firm. Because R&D becomes one of policies that is able to overcome the asymmetric information, and finally the relationship between investment in R&D and earning volatility for stakeholders is very high and positive. This result also supports Eng & Ozdemir (2014); Garner et al., (2002); and Hashi & Stojčić (2013), but not with Santos et al. (2014).

Structural equation 1.4 shows that the influence of debt to equity ratio to intensity of R&D is positive but no significant. It means that the raise of debt to equity ratio can increase R&D intensity but no significantly effect. This can be due to corporate spending on research and development activities have not been adequate nominal amount (the average R & D intensity of 0.20% of the total assets of the company). This supports Thippayana (2014), but is inconsistent with Kale & Shahrur (2007). The influence of *capital expenditure to book value of assets* to R&D intensity is positive and significant. This is suitable with Gaver & Gaver (1993) that stated investment choice in the future is not only on the projects funded by R&D but also the ability to explore the opportunity to get profit. The existence of investment opportunity set gives positive signal to R&D activity (signaling theory). The investment in technology for foreign market and continuous R&D in parent company is the strategies applied by multinational company to penetrate the market (Huang, 2013).

The influence of sales growth to R&D intensity is negative but no significant. It goes along with Schimke & Brenner (2011) who stated that there is different finding between firm growth and R&D. In a firm with low technology, the relationship growth of firm and R&D is negative. While in firm with high technology, the relationship is positive. This study is inconsistent with Goedhuys & Veugelers (2012). Coad & Rao (2010) explained that firms increase expense on R&D if the sales increase.

Meanwhile, the influence of CAPBVA to R&D intensity is significant positive. The research is to examine the relationship between investment in R & D

intensity to the performance of the company in China and showed that companies with intensive investment strategies in R & D will have financial performance was significantly greater in the next year. While Chun et al. (2014) emphasized the importance of investment in R&D company to sustain long-term growth rate of the company. Li (2011) assert that there is a strong connection between financial constraint, the intensity of R & D and stock returns. The intensity of R & D can surmise that stock returns and directions are positive.

The test result of mediation variables of R&D intensity to the effect of DER, CAPBVA, ang GS to To tobin's q are; **First,** R&D intensity did not mediate the influence of DER to To tobin's q significantly with t-test result 0.016316 smaller than t-table value 1.656391. **Second,** R&D intensity did not mediate the influence of CAPBVA to TO TOBIN'S Q significantly with t-test result -0.147360 smaller than t- table 1.656391.**Third,** R&D intensity did not mediate the influence of SG to To tobin's q because t-test result is -0.089836 smaller than t-table 1.656391

5. Conclusion and implications

What's interesting about this is the test results, although R & D intensity is not able to mediate the effect of DER against To tobin's q but when seen from the direct influence of the to tobin's q DER variable is negative, while the indirect effect of the variable DER To tobin's q mediated by R & D intensity is positive. It is clear that R & D intensity is still able to mediate the effect of DER against To tobin's q . This finding also gave input to trade off theory, with debt so the purpose of management to optimize the debt can raise the firm growth (Thippayana, 2014). The contribution to signaling theory, R&D intensity is the value expected by many people, both internal and external. The availability of R&D intensity reflects the condition where the firm has signal on stock price in the future to increase the firm value. From the investors' point of view, the growth of a firm is a sign that it has profitable aspect, and the investors expect good rate of return from the investment. The result suggests the management to be brave to take aggressive act in funding policy. This policy followed by investment on fixed assets, those are assets that are profitable, and the investment on R&D is proven to increase the firm value, so the prosperity of the owners can be reached through the function of finance management.

The second important finding is that R&D intensity can increase the value of the company directly, although the impact is not too meaningful. There are some interesting study that may be the reason, first, the average company in the research samples only spend money on R&D amounted to 0.20%, the value of which is very small compared to the total assets owned by the company, and secondly, the company is not consistent in spend on R&D every year, because there are companies that a sample of this study do not routinely every year to spend on R&D activities.

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