THE EFFECT OF CAPITAL STRUCTURE ON FIRM VALUE WITH THE MEDIATION OF R&D AS THE INTERVENING VARIABLE

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Abstract

Conceptually, 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, company size, and business risk, 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, and non-finance companies registered in Indonesia Stock Exchange during observation period from 2017 to 2013. 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 tobins'q value. Debt to equity ratio and capital expenditure to book value of assets were the sample of this study which influenced indirectly the improvement of tobins'q value through R&D intensity. The result showed R&D intensity and size of the firm gave positive and significant effect on tobins'q value while debt to equity ratio, capital expenditure to book value of assets and earning volatility did not give significant effect to tobins'q value. Meanwhile, debt to equity ratio and capital expenditure to book value of assets gave positive and significant effect on R&D intensity, and sales growth and size of the firm did not influence the R&D intensity.

Keywords: firm value, firm size, sales growth, Investment opportunity set, capital structure, business risk, 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 decision of funding through capital structure can reduce the agency conflict because free cash flow of the firm is sent to the account of debt payment.

Capital structure is an important factor of the 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 order to improve the firm value. Therefore, a manager must be able to decide 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 and French, 1998). 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 one of the 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. The mix of debt and equity of the firm can be measured by leverage (Paramasivan and Subramanian, 2009). Based on the theory of *trade-off* (Fama and Miller, 1972; Myers, 1977, 2001; De Angelo and Masulis, 1980; and Jensen, 1986) 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 and Meckling, 1976). The company's capital structure evaluates the way the company increases the capital needed to build and add to its business activities. This is a mixture of various types of capital and loan capital maintained by companies resulting from corporate financing decisions. In one way or another, business activities must be funded. In all aspects of capital investment decisions, capital structure decisions are important because of the company's direct profitability from those decisions (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; Wright and Ferris, 1997; Walker 2000; and Qureshi, 2006). 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 and Mukhrejee, 1994). Investment Opportunity Set (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 and Charoenwong, 1991). Investment decision is defined as a combination from owned assets (*assets* 5 *place*) and choices of investment in the future with 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 *Investment Opportunity Set* (IOS).

The strategy of firm value setting is focused on the risk and uncertainty (Michalski, 2008). Risk can be defined as the possibility of bad result or unwanted loss (Imam and Malik 2007). According to Brigham and Houston (2006) there are two risk dimension; financial risk and business risk. Business risk is an uncertainty faced by the firm in running the business. Earning volatility depicts the height of business risk and the level of firm's bankruptcy.The profit of firm that is related to earning volatility cannot be separated from the size of the firm. 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 (Hagerman and Ruland, 1979). 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 and 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. Griliches and Klette (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 et al., (2014) in the research showed 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 positive effect on firm's performance. Zhu and 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 relationship between 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

Ross et al. (2010) 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 and Meckling (1976), also describe that manager's decision to determine the capital 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. Bayless and Diltz (1994) and Deangelo and Masulis (1980) explain that in the *static trade off theory*, the optimal capital structure 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 structure 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 and Di Patti (2006) proved that both high leverage of a firm and low equity level have significant effect to improve the firm's performance economically and statistically.

H1. Debt to equity ratio has a positive impact on tobins'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 the 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 and Gaver, 1993 and Smith and Watts, 1992). Yuliani et al. (2012) got the result that there is direct positive and significant effect to firm value. The raise of investment will increase the value of the firm. Wright and Ferris (1997) who did the research in Africa defined that investment decision through divestment affects the firm value.

H2. Capital expenditure to book value of assets has a positive impact on tobins'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 (Tobins'q), while in a firm with high chance of growth, the debt ratio has negative relationship with the firm value. Therefore, the effect of debt on firm value really depends on the chance of growth. However, Lee (2013) clearly found out that there is positive effect given by company growth to profitability. Furthermore, Lee explained that the environment of the company has strong effect on the relationship between company growth and profit. The development of technology is also an important factor to increase the company value (Chen and Chang, 2010).

H3. Growth sales has a positive impact on tobins'q

2.4. Hypotheses for Firm size and firm value

Putu 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) stated that the relationship between firm size and profitability is positive. Khodamipour et al. (2013) in his research found that there

is not any significant relationship between stock risk and firm size with stock return and between firm size and firm value. The review showed that there is significant and direct relationship between market value and liquidity volume and there is also positive and significant relationship between liquidity volume and stock return. This also supported by h 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 effects on performance. Nguyen et al. (2015) explained that in Australia, firm size does not give significant effect on firm value.

H4. Firm size has a positive impact on tobins'q

2.5. Hypotheses for business risk and firm value

High business risk affects the firm ability to increase the profit and finally will affect the firm value. Sari and Hutagaol (2009) also found that business risk has positive effect on firm value. Garner et al. (2002) explained that volatility from cash flow firm operation gives positive effect on the firm growth.

H5. Earning volatility has a positive impact on tobins'q

2.6. Hypotheses for R&D and firm value

Gharbi et al. (2013) emphasize the importance of investment in R&D for a firm, because R&D becomes one of those policies that are able to overcome asymmetric information, and in the end the 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 and Ozdemir, 2013). 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 and Stojcic (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 Santos et al. (2014) the investment in innovation done by the firms does not explain how it works significantly.

H6. R&D Intensity has a positive impact on tobins'q

2.7. 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 and 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

2.8. 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. Yildiz et 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 (Hu, 2013).

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

2.9. Hypotheses for growth sales and R&D

Goedhuys and Veugelers (2011) 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

2.10. Hypotheses for firm size and R&D

Knott and Vieregger (2016) found that firm size influences the choice of R&D strategy. This theory stated that R&D strategy is preferred by big firms, and firm size will improve the R&D process done by the firms. Arias-aranda et al. (2000) found positive relationship between firm size and innovation at firms in Spain. Baldwin (1999), in his research, found that big firms are more innovative than smaller ones because big firms has easier access to funding, so they can spread the consistent innovation fund to bigger volume of sales, the advantages got from economics of scale, and the complementary value between research and development with other activities at firms. Nakajo (1995) stated in his research that the factor influencing R&D expenses is the firm size.

H10. Firm size 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 2008-2014; (2) Annual report. Based on time dimension and order of time, this research is 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 294 firms in 7 years, consisting of 176 manufacture firms and 176 non-finance firms gathered by purposive sampling. The use of single imputation method is chosen to prevent any data loss.

Table 1. Research Data Collection Process

The number of manufacture firms expensing R&D based on PSAK 19						
23	23	24	24	25	29	28
The number of manufacture firms qualified as samples (single imputation method)						
31	31	31	31	31	31	31
The numbers of manufacture firms used as data of research						
15	19	16	18	17	15	14
The number of non-finance firms registered in Indonesia Stock Exchange.						
184	195	199	219	238	255	274
The number of non-finance firms expensing R&D based on PSAK 19						
13	13	12	19	21	21	19
The number of non-finance firms qualified as samples (single imputation method)						
23	23	23	23	23	23	23
The numbers of non-finance firms used as data of research						
16	12	12	14	15	19	17
The number of firms used as data research (observtion)						
31	31	28	32	32	34	31

Authors' tabulation

Table 1 showed the process of qualified samples gathering and the result is there are 49 firms consist of 26 manufacture firms and 23 non-finance firms, with 119 observations.

Table 2 showed the distribution of data research in all sectors in Indonesia Stock Exchange.

Table 2 Sample distribution.

| Panel A : Sample distribution across industries by observation over seven years								
Basic Industry And Chemicals	Miscellaneous Industry	Consumer Goods Industry	Agriculture	Mining	Property, Real Estate And Building Construction	Infrastructure, Utilities & Transportation	Trade, Services & Investment	Total
7	6	13	1	3	7	3	9	49

Authors' tabulation

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 structure, investment opportunity set, sales growth, firm size, and business risk mediated by research and development. The model of empirical study presented in picture 1.

Picture1. Empirical model
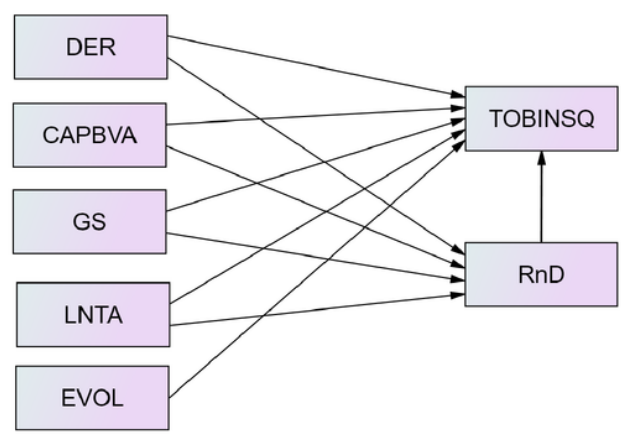
Both sub structure formed in picture 1 are; **First,** sub structure shows the causal relationship between variables DER, CAPBVA, GS, and LNTA with Variable R&D; **Second,** sub-structure stated causal relationship of variables DER, CAPBVA, GS, LNTA, EVOL and R&D with TOBINS'Q variable. In other words, based on both sub-structures, there are 2 structural equations formed :

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

$$+ \quad \beta_{4TOBINS'Q}LNTA + \beta_{5TOBINS'Q}EVOL + \beta_{5TOBINS'Q}R\&D$$

$$+ \ \varepsilon_1 \ldots \ldots \ldots \ldots \ldots \ldots (1.1)$$

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

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 (Lindenberg and Ross, 1981; and Dushnitsky and 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 (Li, 2011; Zhu and Huang, 2012; and Chun et al., 2014). *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 (Ravid, 1988; Adedeji, 1998; Fama and French, 2000; Cuong and Canh, 2012; and Cheng et al., 2010). Factual approach chosen for investment opportunity set was *capital expenditure to book value of assets ratio* (Assih et al., 2006; and Yuliani et al., 2012). The sales growth is the ratio of sales change divided by previous year sales (Dunne and Hughes ,1994). The measurement of business risk variables used *earning volatility* (Homaifar et al., 1994; and Johnson,1997). The firm size in this study was measured with natural logarithm of total assets (Dastgir, 2007; King and Santor, 2008; Chen and Chen, 2011; Berzkalne and Zelgalve, 2011; Loi and Khan, 2012; and Fosu, 2013).

Table 3. Summary of the variables

Variable	Name of the variable	Operationalization	Expected sign
Tobins'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 firm 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.	+
EVOL	Business risk	The change of *earnings before interest, tax, and depreciation* divided by total assets value in book.	+
LNTA	Firm size	Natural logarithm of TA	+

A descriptive statistics for variables are shown in Table 3. On average, the tobins'q data in Indonesia reach 1.49 with the highest tobins'q value is 4.85 and the lowest is 0.29. While for DER, the average is 1.01 x with the highest DER is 3.03 x and the lowest is 0.08 x.

Table 4. Descriptive statistics.

Variable	Mean	Standard deviation	Minimum	Maximum
TOBINSQ	1.499006	0.8999588	0.2912	4.8533
DER	1.006325	0.7001456	0.0810	3.0271
EVOL	3.794602	5.1920571	-13.4975	18.1464
LNTA	14.763499	1.6609435	10.5584	18.6672
RnD	0.231130	.2037244	0.0008	0.7749
CAPBVA	3.063263	6.7309224	-21.7516	29.8685
GS	16.924727	21.2053275	-47.0025	80.3425

Table 4 shows the Pearson correlation matrix and Vector Inflation Factor (VIF) between variables. The result is all variables are far from correlated. The highest correlation coefficient is 47.10% between company size (LNTA) and Tobins'q which shows a positive and significant correlation. While the lowest correlation is 0.60% between R&D and Tobins'q which shows a positive and not significant correlation.

Table 4 Pearson correlation matrix.

VARIABLES	TOBINSQ	DER	EVOL	LNTA	CAPBVA	RnD	GS
TOBINSQ	1						
DER	-.307**	1					
EVOL	.264**	-.161*	1				
LNTA	.471**	-.054	.286**	1			
CAPBVA	.214**	-.080	.071	.262**	1		
RnD	.006	.155*	-.109	-.245**	.024	1	
GS	.055	.078	.261**	.196**	.255**	-.227**	1

4. Empirical findings

Initially, we estimated path analysis using AMOS. The results are reported in Table 5.

TABEL 5
OUTPUT PATH ANALYSIS

			Estimate	S.E.	C.R.	P	Label
RnD	<---	LNTA	-,231	,008	-3,505	***	par_12
RnD	<---	CAPBVA	,159	,002	2,373	,018	par_13
RnD	<---	DER	,173	,018	2,734	,006	par_14
RnD	<---	GS	-,236	,001	-3,581	***	par_20
TOBINSQ	<---	CAPBVA	,066	,008	1,102	,270	par_4
TOBINSQ	<---	GS	-,018	,003	-,287	,774	par_5
TOBINSQ	<---	LNTA	,452	,033	7,396	***	par_6
TOBINSQ	<---	RnD	,167	,262	2,807	,005	par_7
TOBINSQ	<---	DER	-,285	,074	-4,955	***	par_11
TOBINSQ	<---	EVOL	,107	,010	1,782	,075	par_19

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

$$TOBINS'Q = 0,167R\&D - 0,285\ DER + 0,066CAPBVA - 0,018GS + 0,452\ LNTA + 0,107\ EVOL ....(1.3)$$

P	(0,005)	(0,000)	(0,270)	(0,774)	(0,000)	(0,075)
Cr	(2,807)	(-4.955)	(1,102)	(-0,287)	(7,396)	(1,782)

$$R\&D = 0,173\ DER + 0,159\ CAPBVA - 0,236\ GS - 0,229\ LNTA...(1.4)$$

P	(0,006)	(0,018	(0,000)	(0,000)
Cr	(2,734)	(2,373)	(-3,581)	(-3,505)

From structural equation 1.3, the test result of hypothesis, 'the influence of capital ratio (DER) to tobins'q is negative and significantly influence'. capital ratio (DER) which became samples in this research has influence of improving firm value if the capital ratio (DER) decreases. This result supports the one done by Modigliani and Miller (1958); Chung et al. (2013); Zeitun., R. & Tian, 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 tobins'q is positive but no significant effect. So, CAPBVA has less meaning to improve tobins'q value of firm. This study is inconsistent with Myers (1977); Gaver & Gaver (1993); Smith & Watts (1992), stated that firm value is determined by IOS. Adiputra (2016), explains that the IOS on the firm value is positive and significant influence in the ASEAN 5 countries.

The influence of sales growth to tobins'q is negative but significant. This study supports Lang et al., (1996); and Lee (2013). The influence of firm size to

tobins' is positive and significant. Firm size has meaning to improve firm value when total assets increases. It goes along with Putu et al. (2014); Moeljadi (2014); and Gedajlovic and Shapiro (1998). But it is inconsistent with Khodamipour et al. (2013); Mule et al. (2015); and Nguyen et al. (2015).

The influence of earning volatility to tobins'q is positive but insignificant. Earning volatility depicts the height of business risk and level of bankruptcy. Earning volatility is also an indicator that shows business risk of a firm, used by debt holder to predict future earning as a protection to the lent money. Business risk becomes an indicator of return instability got by stakeholders (Gitman, 2003). The research done by Barnes (2001) the result has a negative effect earning volatility and market value if the firm. After re-testing the relationship, including adding control variables such as firm size, leverage, investment current, and sales growth, the influence of earning volatility still gives negative significant result. Amit and Wernerfelt (1990) also found that the risk of business and significant negative on firm value. But this research is inconsistent with Sari and Hutagaol (2009).

The influence of R&D to tobins'q is positive and significant. This goes along with the research by Gharbi et al. (2013) 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 and Ozdemir (2013); Garner et al. (2002) Hashi and Stojcic (2013), but not with Santos et al. (2014).

Structural equation 1.4 shows that the influence of capital structure (DER) to intensity of R&D is positive and significant. It means that the raise of capital structur (DER) can increase R&D intensity significantly. This supports Thippayana (2014), but is inconsistent with Kale and Shahrur (2007). The influence of CAPBVA to R&D intensity is significant positive. This is suitable with Gaver and 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 significant negative. It goes along with Schimke and Brenner (2011) who stated that there is different finding firm growth and R&D. In a firm with low technology, the relationship between firm growth and R&D is negative. While in firm with high technology, the relationship is positive. This study is inconsistent with Goedhuys and Veugelers (2011). Coad and Rao (2010) explained that firms increase expense on R&D if the sales increase.

Meanwhile, the influence of firm size to R&D intensity is significant negative. It is consistent with Akcigit (2008) in his review found that firm size has negative relation with R&D intensity and sales growth. Kim et al. (2003) defined that the bigger the firm size, the less fund to invested in activity R&D. Goodwin (1998) stated that there is no clear relationship between company size and R&D, except for pharmacy firm, the firm size influences R&D expenses. The result is

inconsistent with Knott and Vieregger (2016); Arias-Aranda et al. (2000); and Baldwin (1999).

The test result of mediation variables of R&D intensity to the effect of DER, CAPBVA, GS, and LNTA to Tobins'qare; **First,** R&D intensity mediated the influence of DER to Tobins'q significantly with t-test result 1,769096 bigger than t-table value 1.651906. **Second,** R&D intensity mediated the influence of CAPBVA to TOBINS'Q significantly with t-test result 1,655977 bigger than t-table1.651906.**Third,** R&D intensity did not mediate the influence of GS to Tobins'q because t-test result is -1.416608 smaller than t-table 1.651906, **Fourth,** R&D intensity did not mediate the influence of LNTA to Tobins'q because the t-test result is -2.006881 smaller than t-table at 1.651906.

5. Conclusion and implications

The test result showed that R&D intensity had real mediation role to the influence of capital structure (DER) to TOBINS'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 (Thippiyana, 2014). Chung et al. (2013) explained that firm will increase the capital structure if it has interesting growth chance, in other words, the relationship between capital structure and growth is a correlational positive one (Gul et al., 2012). 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 (Ross, 1977). 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 can significantly increase the value of the company, so the prosperity of the owners can be reached through the function of finance management.

The second important finding is that R&D intensity is able to mediate the influence of CAPBVA to TOBINS'Q. This result contributes to *signaling theory*, with the existence of investment opportunity set which resulting assets growth so it is expected to increase the investment in R&D expenses. R&D is an expected value wanted by all sides, both internal (management) and external (investors, creditors). The effect of this innovation is expected to give positive signal to the firms, because investors expect to get high return from the investment so it affects the raise of firm value (Ross, 1977; and Qiao et al., 2014). Gharbi et al. (2013) emphasizes the importance of investment in R&D to the firms, 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 becomes so high and positive for the stakeholders. This becomes rational because investment in R&D encourages manufacture firms to develop their new products to win the competition in developing country (Eng and Ozdemir, 2013). This will go along with the result that found R&D intensity effect of firm value is positive and significant. This result suggests management to be brave to act by investing in

profitable assets. The investment opportunity set followed by R&D activities is proven to be able to increase the firm value.

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