R&D Spending and Share Price of Listed Companies In the Stock Exchange Of Thailand

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Received: 25/05/20
Revised: 05/01/21
Accepted: 29/03/21

Abstract

The study's main objective aimed to examine possible relationship between research and development (R&D) spending and common share price of listed companies from the Stock Exchange of Thailand (SET). Using stratified random sampling, 210 corporate annual reports of seven industries from the SET were used as the samples. Corporate annual reports during 2016 to 2018 were used to collect R&D spending and corporate characteristics, while SETSMART was used to collect common share price of samples. Descriptive analysis, correlation matrix and panel data analysis were used to analyze the data. As the results, the study found a significantly negative relationship between R&D spending and common share price at 0.05 level, and there was significant relationship between firm size, firm age, audit type, risk, profitability, and share price at 0.05 and 0.01 levels. Using sensitivity analysis, this study found that there was a significantly negative relationship between development spending and common share price at 0.05 level, while no correlation was between research spending and share price at 0.05 level. This study demonstrated that the theory of stock investment and speculator can be used to explain a negative relationship between R&D spending and share price of listed companies in the SET as well as a negative relationship between development spending and share price.

Keywords: R&D spending; share price; listed companies; the Stock Exchange of Thailand

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Introduction

Corporate research and development (R&D) spending is one of corporate important activities that any businesses use to develop and improve their new product, service, and process to create the firms' value (Gharbi et al., 2014). Research and development spending also can be used as competitive advantage, business growth, firm's expected profit, and sustainable development for the corporations to complete their competitors that are in the same market share (Jiang et al., 2019). However, R&D spending can provide both advantage and disadvantage to the corporations. On one hand, R&D spending can improve the different product and service as well as corporate process that their competitors are hard to copy (Callimaci and Landry, 2004). In addition, R&D spending can make the corporations launching product, service, and process that directly response to their customer demand. On the other hand, the corporations have to spend so much money to invest into R&D activity, therefore, it will affect to short-term investors who consider to invest into corporate common share or the other corporate common shares (Franzen and Radhakrishnan, 2009). In Thailand, by Thailand Financial Reporting Standards No. 38 namely intangible asset (2017), R&D spending is included as a part of corporate intangible asset. R&D spending is divided by two groups as research spending and development spending. In terms of research spending, the corporations have to recognize the spending as corporate annual expense which will disclose on income statement. In terms of development spending, on the other hand, the corporations can recognize as intangible asset which will be reported on financial position statement. However, if the corporations have quite high value of R&D spending, they can recognize all R&D spending as intangible asset and cut the amortization in year by year.

Although R&D spending can launch different product and service compared with the competitors and it can provide competitive advantage to the corporations, it makes corporate investors feel insecure in terms of risk that the corporations have to spend so much money for (Duqi et al., 2011; Nord, 2011). Therefore, in investors' perspective, negative correlation was shown betweenthespending and market price of common share (Callimaci and Landry, 2004). This can be explained by theory of stock investment and speculator because investors will to avoid investing into common share of risk and

uncertain companies in this case R&D spending (Chambers et al., 2002). Moreover, the investors will compare gap between actual and expected returns, therefore, if there is wide gap of actual and expected returns, they will concern the companies as high risk investment (Saad and Zantout, 2008). This is because R&D spending can be either successful or unsuccessful.

However, even though there were many previous related studies to investigate R&D spending and to examine the influence of R&D spending on common share price in developed countries (Franzen and Radhakrishnan, 2009; Lev et al., 2005; Callimaci and Landry, 2004; Han and Manry, 2004), few literatures were studied in emerging economic countries (Mozafari, 2017; Wu and Wei, 1998). In Thailand as an emerging economies, there were some evidences related to corporate R&D spending and disclosure (Ekpol, 2007; Sangnapawan, 2007; Monomansatham, 2015; Siripong, 2019) within only one literature that tested the relationship between R&D spending and common share price (Ekpol, 2007). This may be because there were less number of Thai firms providing R&D spending and disclosure into their business (Sangnapawan, 2007). On the other research problem topic, most of prior literatures on this topic focus on Anglo-Saxon market, but Thailand differs in many aspects including civil and common laws, shareholder and investor protection, or corporate R&D spending(Sangnapawan, 2007).

In terms of unclear statement, the results of the relationship between corporate R&D spending and common share price were mixed. For example, although most literatures found a positive relationship between both variables (Lev et al., 2005; Cazavan-Jeny and Jeanjean, 2006; Wu and Wei, 1998; Franzen and Radhakrishnan, 2009; Titi, 2014; Mozafari, 2017), some prior related studies found a negative relationship (Gharbi et al., 2014; Duqi et al., 2011; Nord, 2011; Callimaci and Landry, 2004). The reason of negative relationship is that the value creation from R&D spending is uncertain, therefore, the investors recognizes corporate R&D spending as a risk to invest their money into the corporate common share (Chamber et al., 2002), while the reason of positive correlation between both variables is that the corporations used R&D investment to response their stakeholder demand including their investors, therefore, if the demand is responded, the corporations can earn better outcomes such as performance,

image and reputation, and firm value and share price (Han and Manry, 2004). However, a previous study in Thailand from Ekpol (2007) found no relationship between corporate R&D spending and common share price. It is because there was only eleven percent of companies listed in Thailand providing R&D spending (Sangnapawan, 2007).

From research problems above, therefore, this research objective was to test any possible relationship between R&D spending and common share price of company listed from the Stock Exchange of Thailand (SET).

The researchhas provided some contributions expected. This research will demonstrate whether theory of stock investment and speculator can be used to explain a negative relationship between R&D spending and share price of listed companies from the SET. This study also can contribute and update to the literature by testing the relationship between R&D spending and common share price in Thailand where the last related study was happened in 2007. With research findings, Thai listed companies will be able to understand their situation of the value creation from R&D spending. Finally, regulators and policy makers such as the Stock Exchange of Thailand, and Federation of Accounting Professions will contribute the impact of R&D spending on common share price of listed companies in Thailand.

The study structure begins with theoretical perspective to explain the reason of relationship between R&D spending and share price represented by the theory of stock investment and speculator. Prior related literatures were used to review literature and develop for hypothesis in the next section. Methods were descripted consisting of population and sample, data collection, variable measurement, and data analysis. Next, findings and discussions were indicated by explanation from statistic software. Finally, conclusion, contribution, limitation, and suggestion for future study were used to explain.

Theoretical Perspective

Even though some prior related studies (Nord, 2011; Callimaci and Landry, 2004) used stakeholder theory to explain the positive relationship between R&D spending and common share price because the corporations used R&D investment to response their stakeholder demand including their investors, therefore, if the demand is responded,

the corporations can earn better outcomes (Han and Manry, 2004), the theory of stock investment and speculator was used to explain a negative relationship between R&D spending and share price of listed companies in the SET in this study. There were many literatures used the theory of stock investment and speculator (Cazavan-Jeny and Jeanjean, 2006; Wu and Wei, 1998;Mozafari, 2017). This is because R&D spending can be either successful or unsuccessful. Therefore, the investors may avoid investing into common share of risk and uncertain companies in this case R&D spending. Moreover, the investors will compare gap between actual and expected returns, thus, if there is wide gap of actual and expected returns, they will concern the companies as high risk investment (Saad and Zantout, 2008). R&D spending can develop many types of corporate risks such as the risk of product or service failures, earnings variability, systematic risk, corporate bond risk, and share return and price volatility (Gharbi et al., 2014).

The negative influence of corporate R&D spending on common share price is that the value creation from R&D spending is uncertain, therefore, the investors recognizes corporate R&D spending as a risk to invest their money into the corporate common share (Chamber et al., 2002). On the other idea of negative relationship between them, the investors can be fail or ignore to reward long-term corporate spending on R&D in their assessment (Duqi et al., 2011). For example, Penman and Zhang (2002) and Lev et al. (2005) found and indicated that the common share price were undervalued when corporate R&D investment grow. Therefore, if corporate risk is signaled by research and development spending then corporate common share price experiencing risk increase due to R&D spending increases are properly discounted rather than common share price not experiencing such increases (Berk et al., 2004).

Literature Review and Hypothesis Development

In Thailand, R&D spending is included as part of corporate intangible asset under Thailand Financial Reporting Standards (TFRS) No. 38 namely intangible asset (2017). R&D spending is divided by two groups as research spending and development spending. In terms of research spending, the corporations have to recognize the spending as corporate annual expense which will disclose on income statement. In terms of development

spending, on the other hand, the corporations can recognize as intangible asset which will be reported on financial position statement. However, if the corporations have quite high value of R&D spending, they can recognize all R&D spending as intangible asset and cut the amortization in year by year.

R&D spending is one of corporate important activities that businesses use to develop and improve their product and service as well as process under researches (Chamber et al., 2002). R&D spending can be used as competitive advantage for the corporations to complete their competitors that are in the same market share (Jiang et al., 2019). However, R&D spending can provide both advantage and disadvantage to the corporations. On one hand, R&D spending can improve the different product and service as well as corporate process that their competitors are hard to copy (Cazavan-Jeny and Jeanjean, 2006). In addition, R&D spending can make the corporations launching product, service, and process that directly response to their customer demand. On the other hand, the corporations have to spend so much money to invest into R&D activity, and it will affect to short-term investors who consider to invest into corporate common share or the other corporate common shares (Franzen and Radhakrishnan, 2009).

As the previous related studies in Thailand, there were a little literatures on R&D spending or disclosure. For example, Sangnapawan (2007) investigated R&D spending of Thai listed companies finding that there were only eleven percent of all samples used in the study spending R&D into their operation. Monomansatham (2015) found that there was a positive relationship between firm size and R&D spending, while firm risk (leverage) had negatively correlated with R&D spending. Siripong et al. (2019) found there was a negative influence of R&D disclosures on corporate performance. To relate the prior literature with this study, Ekpol (2007) tested for the correlation between R&D expense and change of market price of Thai corporate common share in the SET finding that there was no any possible relationship between both variables.

To develop the hypothesis, the results of relationship between R&D spending and corporate common share price were mixed. On one hand, most researchers (Penman and Zhang, 2002; Lev et al., 2005; Saad and Zantout, 2008; Cazavan-Jeny and Jeanjean, 2006; Wu and Wei, 1998; Franzen and Radhakrishnan, 2009; Mozafari, 2017) found a negative

relationship between R&D spending and share price. This is because R&D spending can be either successful or unsuccessful. Therefore, the investors may avoid investing into common share of risk and uncertain companies in this case R&D spending. Moreover, the investors will compare gap between actual and expected returns, thus, if there is wide gap of actual and expected returns, they will concern the companies as high risk investment. On another hand, some literatures (Gharbi et al., 2014; Duqi et al., 2011; Nord, 2011) found a positive relationship between R&D investment and share price. It is because the corporations used R&D investment to response their stakeholder demand including their investors, therefore, if the demand is responded, the corporations can earn better outcomes such as performance, image and reputation, and firm value and share price. However, in Thailand, only one study found no correlation between both variables (Ekpol, 2007). This may be because there were only eleven percent of Thai listed companies having R&D spending at that time. Thus, this research has hypothesis that:

H: There is a negative relationship between R&D spending and share price of listed companies.

Methods

Population of this research was all companies listed from the SET during 2016 to 2018. But, the study excluded (1) listed companies in financial industry and property fund and REITs section of property and construction industry because they have used not only the regulation from the SET, but also the Bank of Thailand (BOT), (2) no annual reports between 2016 and 2018, (3)companies registering in the SET after 2016, and (5) listed companies under rehabilitation. Using stratified random sampling, firstly, companies which provided R&D spending were collected from each industry where there are only seven industries in the SET. Secondly, ten firms from each industry were chosen by using simple random sampling. There were 70 listed companies from the SET using as the samples after conditions above, therefore, 210 corporate annual reports during 2016 to 2018 were used to collect the data.

Annual reports were used to collect the data of R&D spending as well as corporate characteristics, while SETSMART website was used to collect data of share price of

samples. In terms of variables' measurement, all variables used in this study were withdrawal by the previous related studies (Duqi et al., 2011; Gharbi et al., 2014; Titi, 2014; Mozafari, 2017). There were three main variable groups used in this study which are dependent variable as share price, independent variable as R&D spending, and control variables by using corporate characteristics. For example, share price was measured by average price before and after seven days of annual report announcement date, while R&D spending was measured by using million baht unit from accounting note in annual report. On the other hand, there were five corporate characteristics used in this study which are firm size, firm age, audit type, risk, and profitability. Table 1 indicates the variables' measurement.

Table 1: Variable's Measurement

Variable	Notation	Measurement
1. Share Price	PRICE	Average share price before and after seven days (Baht) of annual report announcement date
2. R&D Spending	R&D	R&D spending (Million baht)
3. Firm Size	SIZE	Total Asset (Million baht)
4. Firm Age	AGE	Firm age (Year)
5. Audit Type	AUDIT	Dummy variables as 1 = Big 4 auditors, and 0 = otherwise
6. Risk	RISK	Debt to equity ratio
7. Profitability	PROFIT	Return on asset (ROA)
8. Research Spending	SEARCH	Research spending (Million baht)
9. Development Spending	DEVELOP	Development spending (Million baht)

To examine possible relationship between R&D spending and share price of listed companies from the SET, correlation matrix and panel data analysis were used in this study. Correlation matrix was used to test multicollinearity problem among variables used, while panel data analysis was used to test the relationship. Panel data analysis was used in multiple regression because main assumptions of panel data analysis is that the observations in every cross-section are independent of each other and ability of pool data. Moreover, panel data analysis offers more accurate influence of model parameters by containing more degree of freedom and more sample variability. Panel data analysis can

decrease multicollinearity between current and lag variables to estimate unrestricted time-adjustment patterns. Thus, panel data analysis was used to test the hypothesis development in this study. The research divides R&D spending within two types under the Thai Financial Reporting Standards (TFRSs) as research spending and development spending. Therefore, sensitivity analysis was used to examine any possible relationship between research spending, development spending, and share price. Both main equation and sensitivity analysis equation were shown below:

$$PRICE = a + b1R\&D + b2SIZE + b3AGE + b4AUDIT + b5RISK + b6PROFIT + error$$

$$PRICE = a + b7SEARCH + b8DEVELOP + b2SIZE + b3AGE + b4AUDIT + b5RISK + b6PROFIT + error$$

Findings and Discussions

From 210 samples used in this study, the average of R&D spending of Thai listed companies was 3,313,208.262 baht which separate within two spending as research spending and development spending. The most common R&D spending was development spending with 3,204,975.167 baht, while research spending was only 119,619.285 baht. This is because research spending has been recognized as corporate expense that will be sum into the corporate income statement, while the corporations can recognized development spending as intangible asset which is canbe deferred more thanone accounting year. In addition, the development spending is in the financial position statement. On the other hand, average share price of samples used in this study was 28.711 Baht per share.

Correlation matrix was also used to test multicollinearity problem among variables used, therefore, there were seven variables consisting of one dependent variable, one independent variable, and five control variables. Based ona fixed effects model for panel testing, the variance inflation factor (VIF) of the correlation matrix between the variables was 3.321, which indicates that there was no multicollinearity which would be indicated by a VIF exceeding 10 (Vanstraelen et al., 2012). The low coefficients inthe correlation matrix between the variables used in the study therefore indicated that multicollinearity was unlikely to be a problem in the multiple regression (Suttipun, 2018). Thus, multicollinearity problem was not existed in this study.

Table 2: Descriptive Analysis and Correlation Matrix

Variable	PRICE	R&D	SIZE	AGE	AUDIT	RISK	PROFIT
PRICE	1	-.090	.510**	.317**	.251**	-.042	.712**
R&D		1	-.026	-.166*	.088	.087	-.005
SIZE			1	.379**	.241**	.286**	.718**
AGE				1	.053	-.134	.460**
AUDIT					1	.104	.233**
RISK						1	.190**
PROFIT							1
MEAN	28.711	3.313	47.494	33.104	1.442	1.433	2.455
SD	77.978	7.936	10.654	14.363	.494	2.026	7.196
VIF	-	1.047	3.239	1.402	1.079	1.181	3.321

** is significant at 0.01, and * is significant at 0.05

To test the hypothesis development ofrelationship between of R&D spending and market price of 210 corporate common share during 2016 to 2018, panel data analysis was used to analyze (Table 3, the main model). This research found the negatively significant relationship between R&D and PRICE at 0.05 level. Using control variables, SIZE, AUDIT, and RISK had negatively significant correlation with PRICE at 0.05 and 0.01 levels, while there was a positive relationship between PROFIT and INVEST at 0.05 level. In addition, No relationship was between AGE and PRICE at 0.05 level. This result was consistent with the prior studies of Penman and Zhang (2002), Lev et al. (2005), Wu and Wei (1998), Franzen and Radhakrishnan (2009), Titi (2014), and Mozafari (2017). The negative relationship between R&D spending and share price was because investors tend to avoid investing into common share of risk and uncertain companies in this case R&D spending. Moreover, the investors will compare gap between actual and expected returns, therefore, if there is wide gap of actual and expected returns, they will concern the companies as high risk investment. In Thailand, R&D spending of companies can make the investors feel insecure because the companies may spend money for research and development for nothing which makes high gap between their actual and expected returns. Therefore, the result of this study was supported by the theory of stock investment and speculator.

Table 3: Panel Data Analysis

Variables	Main Model		Sensitivity Analysis	
	B	t (sig.)	B	t (sig.)
Constant	63.139	4.063**	63.325	4.078**
R&D	-9.549	-2.065*	-	-
SEARCH	-	-	-9.357	-1.299
DEVELOP	-	-	-9.699	-2.097*
SIZE	-1.282	-2.117*	-1.305	-2.154*
AGE	-.402	-1.360	-.402	-1.362
AUDIT	18.032	2.410*	17.525	2.340*
RISK	-6.755	-3.512**	-6.808	-3.541**
PROFIT	9.708	10.658**	9.845	10.758**
R Square	.571		.573	
Adjust R Square	.558		.559	
F Value (sig.)	44.942**		38.790**	
N	210		210	

** is significant at 0.01, and * is significant at 0.05

Table 3 in the sensitivity analysis model also presents the results of the sensitivity analysis conducted using each R&D spending as research spending and development spending. The study found that there was a significantly negative relationship between DEVELOP and PRICE at 0.05 level, while no relationship was between SEARCH and PRICE at 0.05 level. This is because, on one hand, research spending of Thai listed companies was quite low spending during period being study which was only 3.59 percent of all R&D spending, and the research spending was recognized as corporate expense (TFRS, 2017). Therefore, the investors did not use corporate research spending as potential information for decision making. On the other hand, development spending was recognized as corporate capitalization under the Thailand Financial Reporting Standards (2017) No. 38 namely intangible asset. With high level of development spending, the investors did not believe the value creation of development spending, thus, they did see the spending as risk or uncertain rather than value (Chan et al., 2001). Moreover, the result of negative relationship between development spending and common share price was consistent with Franzen and Radhakrishnan (2009) finding that R&D spending was negatively associated with share price for profit listed companies, while it was positively correlated with loss listed companies. In this study, ROA which was represented from corporate profitability was indicated all samples used as the profit firms, therefore, there was a negative relationship

between development spending and common share price.However, in terms of control variables used, the relationship between control variables and share price was similar findings with the main model.

Conclusion and Suggestion for Future Study

To answer the research question whether is there any possible correlation between R&D spending and market price of Thai corporate common share, the research indicated that more common R&D spending was in development spending than research spending. Moreover, this study found the negatively significant relationship between R&D spending and common share price. Separating thespending as research spending and development spending, this study also found negative relationship between development spending and share price, while there was no relationship between research spending and share price. Using control variables, there was the positively significant relationship between audit type, profitability, and market price, but, firm size and leverage were positively correlated with share price.

This result of negative relationship between R&D spending and share price was consistent with the prior studies of Saad and Zantout (2008), Franzenand Radhakrishnan (2009), and Mozafari (2017) because the investors tend to avoid investing into common share of risk and uncertain companies in this case R&D spending. Moreover, the investors will compare gap between actual and expected returns, therefore, if there is wide gap of actual and expected returns, they will concern the companies as high risk investment. In Thailand, corporate R&D spending can make their investors feel insecure because the companies may spend money for research and development for nothing which makes high gap between their actual and expected returns.

This study provides some contributions. In theoretical contribution, the research can demonstrate that the theory of stock investment and speculator can be used to explain a negative correlation between R&D spending and share price of Thai listed companies. Moreover, this study results can extend the literature of relationship between R&D spending and common share price in emerging economic countries. In terms of practical contributions and implications, the corporations can concern their R&D spending in both

positive and negative way. On one hand, R&D spending can produce innovational product, service, or process which make the corporations having more profitability, greater image, and high sustainability. However, thespending can provide risks which make the investors feel insecure for decision making. Next, although there was a negative relationship between R&D spending and common share price, the investors should consider the other factors and do not be panic with the risk of corporations. Finally, regulators and policy makers such as the SET, and Federation of Accounting Professions will implicate the impact of R&D spending on common share price in Thailand.

However, there are some limitations in this study that have to be mentioned. First, even though longitudinal study was used in this study, there were only three year to investigate the extent and level of R&D spending as well as the relationship between R&D spending and share price. Secondly, panel data analysis is the limited time series which may result in imprecise estimate of R&D spending on common share price. Next, there were only 70 samples used in this study, but Thai firms in the SET were over 600 firms. Finally, this study focused on only the SET, but there are two capital markets in Thailand which are the SET and the Market for Alternative Investment (MAI). Therefore, the suggestion for future study will investigate R&D spending of all listed companies in both capital markets within five to ten working years as well as testing for the influence of R&D spending on firm value and firm performance.

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