

**ANALYSIS OF STOCK MARKET PERFORMANCE OF THAI COMPANIES
PRACTICING SUSTAINABILITY MANAGEMENT**



**AN INDEPENDENT STUDY REPORT SUBMITTED IN PARTIAL
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MASTER OF SCIENCE IN LOGISTICS AND SUPPLY CHAIN
MANAGEMENT
INTERNATIONAL COLLEGE
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2018
KMITL-2018-IC-M-002-004**

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MPANDUJI GASTO MATHIAS

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IS TITLE	Analysis of Stock Market Performance of Thai Companies Practicing Sustainability Management
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ABSTRACT

Sustainability management in the supply chain is very crucial for company sustainability performance, which in turn may impact its stock performance. This study investigated the stock market performance of Thai companies, which have adopted sustainability practices over the period of 2013 until 2017. It analyzed companies listed in Thailand Sustainability Investment (THSI) scheme and non-THSI listed companies. The impacts were measured using Capital Asset Pricing Model (CAPM) technique. This study hypothesized that companies adopting Corporate Sustainability (CS) practices earn a high excess return and can reduce their stock returns volatility. The study found that the average cost of equity and the coefficient beta of companies listed in THSI scheme outperformed non-THSI listed companies. Whereas there was no portfolio that generated an excess return above the given market risk. The results also show that THSI listed companies have a negative correlation with stock return volatility and the average excess return. However, there is no significant correlation between CS practices adoption and the average stock returns shown by Pearson correlation test results. The stock portfolio performance of THSI listed portfolio indicates better stock performance compared to non-THSI listed portfolio whereas, Treynor ratio and Sharpe ratio show positive results. Therefore, it is concluded that investors should demand

higher risk compensation for stocks of non-THSI listed than THSI ones. As for the

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companies, their management should integrate sustainability in their mission to ensure long-term growth of the companies and wellness of the society.



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First and foremost, I would like to thank God for giving health and enabling me to do this work. It would also be difficult without the contribution of many people this study would not have existed. It owes the existence to the supports and inspirations from a lot of people.

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Mpanduji Gasto Mathias

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TABLE OF CONTENTS

Chapter	Page
ABSTRACT.....	I
ACKNOWLEDGMENT.....	III
TABLE OF CONTENTS.....	IV
TABLE OF CONTENTS.....	V
LIST OF TABLES.....	VI
LIST OF FIGURES.....	VII
LIST OF EQUATIONS.....	VIII
LIST OF ABBREVIATIONS.....	IX
CHAPTER 1 INTRODUCTION.....	1
1.1 Research Background.....	1
1.2 Statement of the Problem.....	4
1.3 Objectives of the Study.....	5
1.4 Logical Framework of the Study.....	6
1.5 The Scope of the Study.....	7
CHAPTER 2 LITERATURE REVIEW.....	8
2.1 Sustainability.....	8
2.2 Corporate Sustainability Practices.....	11
2.3 Sustainability Reporting.....	13
2.4 Analysis of Stock Market Performance.....	14
2.5 Corporate Sustainability and Stock Markets Performance.....	16

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TABLE OF CONTENTS

(Continued)

Chapter	Page
2.6 Research Hypotheses	18
CHAPTER 3 RESEARCH METHODOLOGY	20
3.1 Data Collection	20
3.2 Market Model – CAPM	21
3.3 Size and Returns	22
3.4 Portfolio Performance Measurement	25
CHAPTER 4 RESULTS AND DISCUSSIONS.....	28
4.1 Descriptive Statistical Analysis	28
4.2 Three-Factor Model Regression	32
4.3 Excess Returns, Stock Volatility, and CS.....	34
4.4 Portfolio Performance Measurement	35
CHAPTER 5 CONCLUSIONS AND RECOMMENDATIONS	37
REFERENCES	41
APPENDIX A.....	45
Appendix B.....	47
Appendix C.....	49
APPENDIX D.....	50
AUTHOR BIOGRAPHY.....	51

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LIST OF TABLES

Tables	Page
Table 1.1 SET ranking in the SSE sustainability performance indicator	2
Table 2.1 Conceptual comparison of sustainable Business Model Innovation and Service Design.....	11
Table 3.1 Sample size	21
Table 3.2 Sample size based on portfolio categorization by market capitalization and book-to-market value.	23
Table 3.3 The average of stock returns and Standard Deviation (SD) of Low, Medium and High portfolio	25
Table 4.1 A summary of descriptive statistics of average and SD of the excess returns and stock returns volatility of the THSI and non-THSI listed companies.	29
Table 4.2 Cost of equity and the stock return of the THSI and non-THSI listed companies	30
Table 4.3 Regression results of the Three-factor CAPM.....	33
Table 4.4 Coefficient alpha and a beta of the CAPM Three factor model of the industry group inclusion.....	34
Table 4.5 Correlation results.....	35
Table 4.6 Stock market performance measurement.....	36

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LIST OF FIGURES

Figures	Page
Figure 1.1 ASEAN countries FTSE4Good performance.....	3
Figure 1.2 Mapping statement of the problem.....	5
Figure 1.3 Logical framework of the study	6
Figure 1.4 Scope of the study	7
Figure 2.1 Sustainability pillars	9
Figure 2.2 COP21 Major outcomes of the Paris Agreement	10
Figure 2.3 Methods of stock markets performance analysis.....	15
Figure 2.4 Daily trading at stock exchange of Thailand.....	17
Figure 4.1 Trends of stock return for both THSI listed and non-THSI listed companies stock volatility for 39 months.....	31
Figure 4.2 Trends of stock return volatility of THSI and non-THSI listed companies of the SMB and HML portfolio for 39 months.....	32


LIST OF EQUATIONS

Name	Equation	Page
One Factor CAPM	$(R_{pt} - R_f) = \alpha_p + \beta (R_{mt} - R_{ft}) + \varepsilon_{pt}$	22
SMB	$SMB = \frac{1}{3}(SL + SM + SL) - \frac{1}{3}(BL + BM + BH)$	23
HML	$HLM = \frac{1}{2}(SH + BH) - \frac{1}{2}(SL + BL)$	23
Three-Factor CAPM	$(R_{pt} - R_f) = \alpha_p + \beta_1 (R_{mt} - R_{ft}) + \beta_2 SMB + \beta_3 HML + \varepsilon_{pt}$	24
Sharpe Ratio	$\text{Sharpe ratio} = \frac{E(R_p) - R_f}{SD}$	26
Treynor Ratio	$\text{Treynor ratio} = \frac{E(R_p) - R_f}{\beta_i}$	26
Jensen Ratio	$(R_{pt} - R_f) = \alpha_p + \beta (R_{mt} - R_{ft})$	27

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LIST OF ABBREVIATIONS



ASEAN	Association of Southeast Asian Nations
CAPM	Capital Asset Pricing Model
CNN	Cable News Network
CS	Corporates Sustainability
CSR	Corporates Social Responsibility
DJSI	Dow Jones Sustainability Index
ESG	Economic Social and Governance
FTSE	Financial Times Stock Exchange
GRI	Global Reporting Initiatives
HML	High Minus Low
IFC	International Finance Corporation's
KPGM	Klynveld Peat Goerdeler Marwick
MAI	Market Alternatives Investment
MIT	Massachusetts Institute of Technology
SET	Stock Exchange of Thailand
SMB	Small Minus Big
SSE	Sustainable Stock Exchanges
WCED	World Commission on Environment and Development

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CHAPTER 1

INTRODUCTION

In this chapter, the rationale for this study is explained. The chapter begins by presenting the context within which this study was conducted as well as the research background. Then, it is followed by a statement of the problem where the motive behind this study is discussed. It then proceeds to explain the objectives of the study. Also, the logical framework is presented as a blueprint for understanding this study. The chapter finishes with the explanation of the scope of the study.

1.1 Research Background

In the recent years, the number of companies adopting sustainability practices into their business is increasing, evidenced by world stock markets inclusion of sustainability index (Cunha and Samarez, 2012). The justification of this increase is seen in different areas such as the number of companies issued sustainability report, availability of ethical indexes worldwide, number of research conducted in the field of corporate sustainability and investment made by companies on sustainability program.

KPMG is a professional service and world top five audit company, which conducts a survey on sustainability performance. In the 2015 survey report, it shows that the trend of companies issuing sustainability reports is significantly growing, where nearly more than half of the world's 250 largest companies released sustainability reports (KPGM, 2015). The report insists that there was a high trend of reporting sustainability practices in Asia Pacific companies.

Companies are using the ethical index to evaluate sustainability performance. The mostly known ethical indexes are Dow Jones Sustainability Index (DJSI) and

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FTSE4GOOD, which were established in 1999 and 2001, respectively. Companies are selected into the indexes based on best-in-class benchmarks method (DJSI, 2017).

There are more than 82 stock exchanges worldwide with scheme that takes into consideration Environmental, Social and Good governance (ESG) practices. The report released by Sustainability Stock Exchanges (SSE) identifies an increase of exchanges taking efforts that contribute to creating more sustainable capital markets. One development was the sheer number of exchanges now partnering with the SSE initiative. The SSE report showed that SET is one of the 58 World stock exchanges, representing over 70% of listed equity markets. These stock exchanges are known for making a public commitment to advancing sustainability in their markets and are now official SSE Partner Exchanges (Sustainable stock exchanges, 2016).

Table 1.1 SET ranking in the SSE sustainability performance indicator

Country	Company	SEE partner	ESG guidance	ESG training	ESG report	ESG green bond
Singapore	769	No	Yes	No	Yes	No
South Africa	397	Yes	Yes	Yes	Yes	Yes
Switzerland	270	No	No	No	Yes	No
Thailand	634	Yes	Yes	Yes	Yes	Yes

Source: Sustainable stock exchanges initiative report (2016)

Thai companies earned the highest average score in the ASEAN CG Scorecard for the fourth consecutive year showing that Thai firms continue to strive for international levels of sustainability in the region. Thai companies are ranked high and among ASEAN

capital markets leading for a consecutive of two years (Stock Exchange of Thailand, 2015) as shown in Figure 1.1.

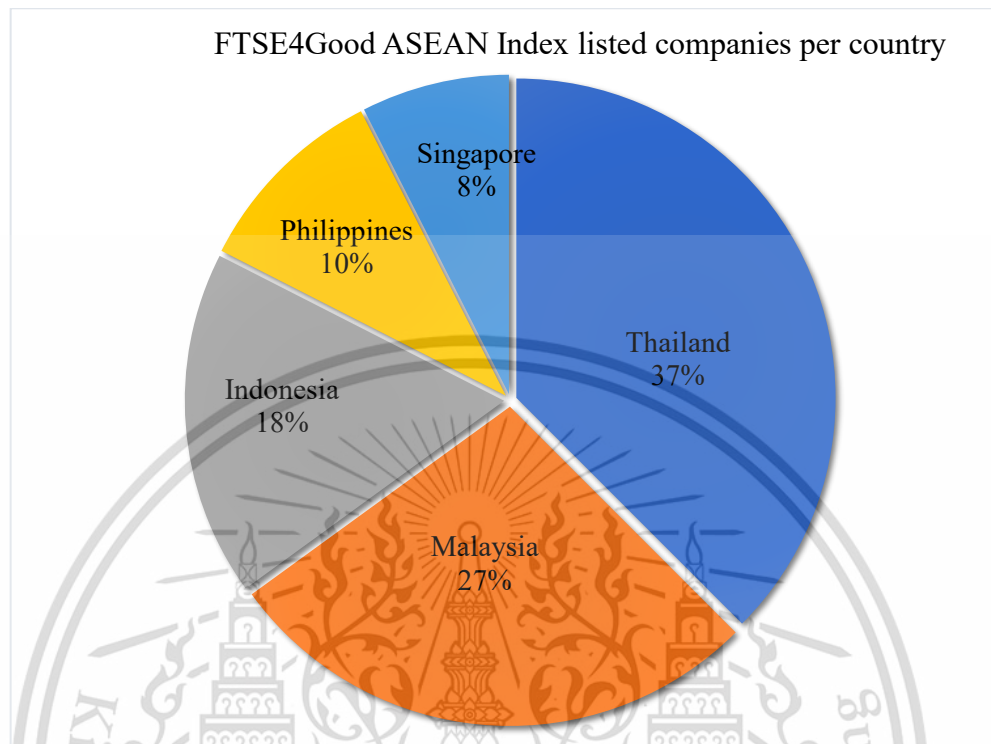


Figure 1.1 ASEAN countries FTSE4Good performance

In 2015, the Stock Exchange of Thailand (SET) established a scheme to address sustainability called THSI. The scheme consists of companies that qualified a sustainability assessment test. The participating firm must achieve scores at least 50 percent in economic, social, environment dimensions to be included in the scheme. A distinguished panel of judges that makes the selection consist of esteemed professionals on ESG as well as related organizations in the capital market.

In this sustainability trend, Thai companies have attained best results on sustainability practices. So far, there are 30 companies among 80 constituents from six countries listed in FTSE4Good ASEAN Index. Also, according to a 2017 report on sustainability performance, there were 17 Thai companies listed in DJSI World and 65 companies in THSI scheme (SET, 2017). Thus, studying companies trading at SET has

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motivated and boosted the morale to find company's adaptability of sustainability practice and their stock market performance in the Thai market.

According to the Fortune Global 500 report of 2017, sustainability management has picked a new face since the occurrence of terrible floods disaster of 2011 in Thailand. The floods harmed more than 160 companies in the textile industry and halted nearly a quarter of the country's garment production, which caused increases in global prices by 28%. Companies are using sustainability strategies to address these threats such as loss of their supply chain. For example, after 2011 floods in Thailand, companies like Mars, Unilever, and Nespresso invested in Rainforest Alliance certification to help farmers deal with climate volatility. Participation of these companies narrates that sustainability activity among Thai companies adheres to sustainable investment procedures.

The first report to quantify spending's from Fortune Global 500 (2017) insists that US and UK companies spend up to 15.2 billion dollars per a year on Corporate Social Responsibility (CSR) activities. During the 2008 economic recession, it was noticed that companies adopting sustainability practices conceded better advantage of performance in financial markets into an average increase of 650-million-dollar market capitalization per company. The report also emphasized that good environmental performer experienced a reduced cost of debt by 40-45 basis points.

1.2 Statement of the Problem

There is increasing spending's in sustainability management program in many companies. For example, US and UK companies spend up to 15.2 billion dollars per a year on CSR activities. It is also known that some of the companies decide to change their operation strategy such as logistics and supply chain strategy to include sustainability practices. These programs require massive investments. Companies do CS to improve

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risk management, customer satisfaction for customers demanding sustainable products, improving operation efficiency and financial performance. Also, the number of investors that do not invest in firms with weak sustainability practice have increased (Unruh, 2016). In the recent years, many researchers have focused on CS, and World-Wide stock market exchanges are including the ethical index in their markets. The question here is, do these initiatives and investments strategies done by companies on sustainability management have impacts in stock market performance? This study analyzed the stock market performance of Thai companies practicing sustainability management.

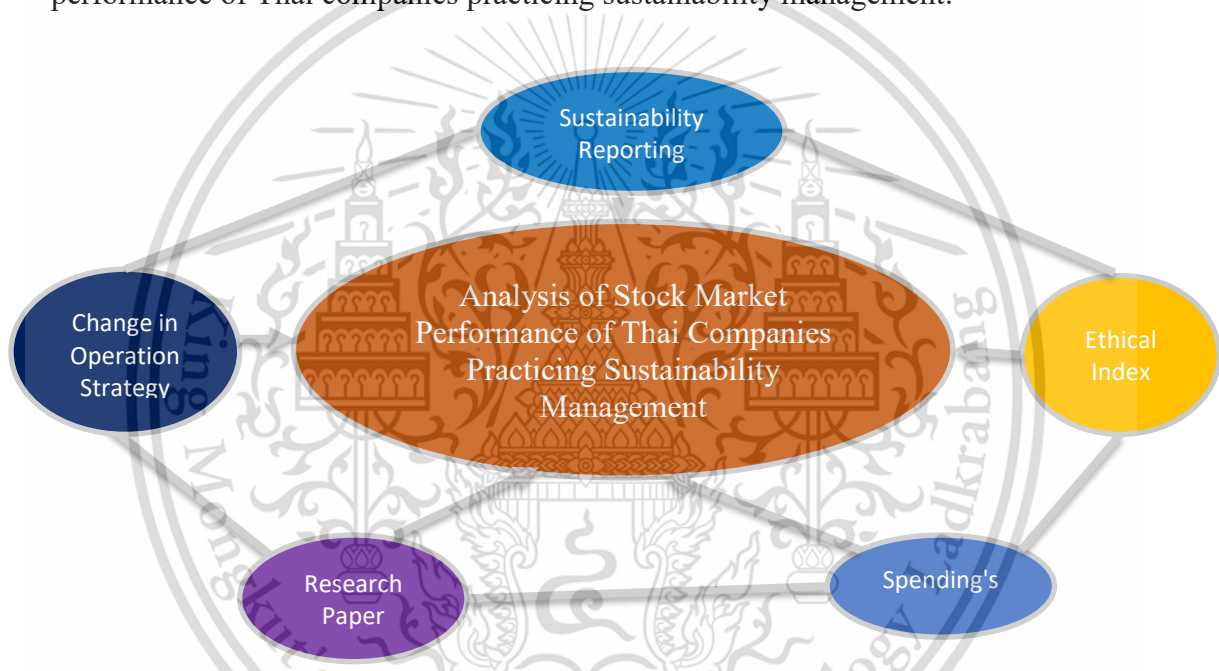


Figure 1.2 Mapping statement of the problem

1.3 Objectives of the Study

The objectives of this study are derived from the relationship between sustainability management by companies and stock market performance. They are summarized as follows:

Objective 1: To determine the excess return of THSI listed companies and non-THSI listed companies

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Objective 2: To determine the stock return volatility of THSI listed and non-THSI listed companies.

Objective 3: To find the relationship between Stock Market Performance (SMP) and Corporate Sustainability (CS).

1.4 Logical Framework of the Study

The study analyzed the stock market performance of Thai companies in the view of the THSI and non-THSI listed companies. Also, it considered the two variables which are stock return volatility and the excess stock return of the portfolio. Furthermore, it analyzed the two coin of the idea which involves companies and investors perception when investing in sustainability management and stock returns respectively. Figure 1.3 depicts the logical framework of the notion that, sustainability practices result in low stock return volatility and the high excess return of the risk asset.

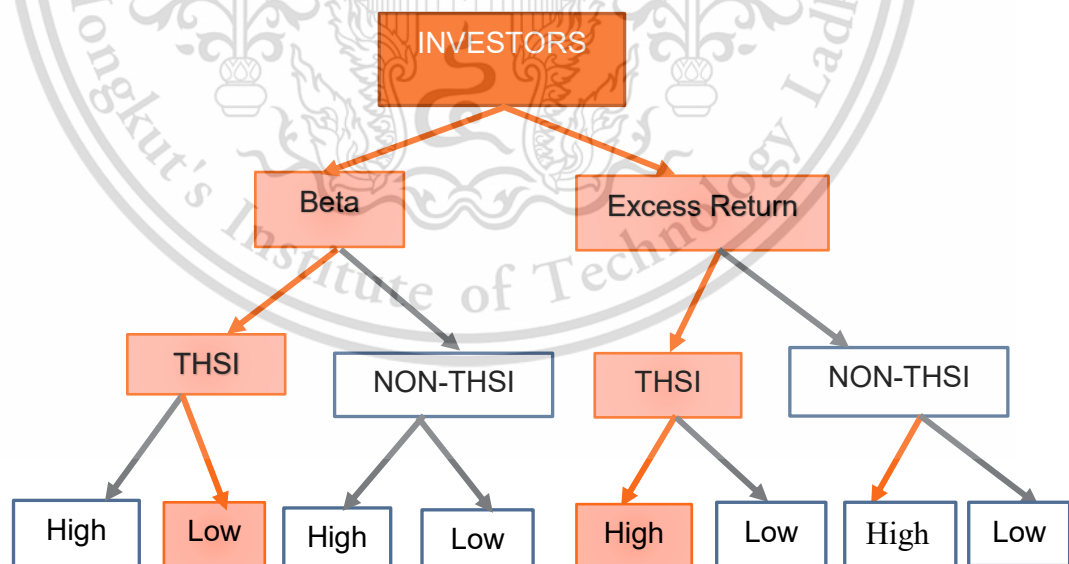


Figure 1.3 Logical framework of the study

1.5 The Scope of the Study

This study considers Thai companies listed in SET100 index, as of 2016, plus 17 THSI listed companies, which are not included SET100, making a total of 117 companies as the domain for the study population. Out of these 117 companies, 54 of them are THSI-listed companies, and 63 companies are non-THSI listed companies. Data used in this study is scoped to cover 39 months starting from May 2013 to May 2017. However, the number of the sample population is further reduced to 86 companies consisting of 39 THSI and 47 non-THSI listed companies

It should be noted that, even though THSI scheme was launched in 2015, this study scopes company samples and data back to 2013 because it is assumed that companies selected to be included in THSI might have performed well regarding sustainability practices before 2015 to be involved in the scheme.

This study focused on the companies listed at THSI scheme and non-THSI listed companies with the aim of determining their stock performance. The study comprises of 5 years from May 2013 until May 2017, which includes 39 months in total. The primary variables of the study are excess portfolio return and stock return volatility.

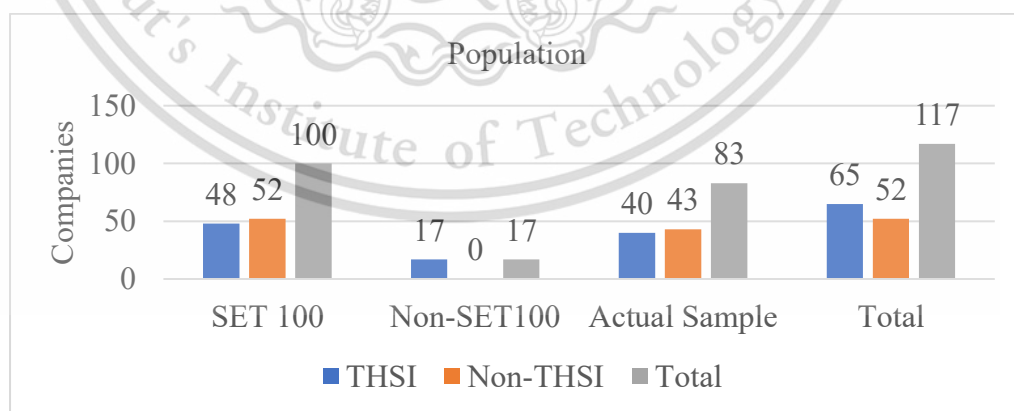


Figure 1.4 Scope of the study

CHAPTER 2

LITERATURE REVIEW

This chapter provides insight into the case study that comprises the focus of this study. Importantly, it sets the context of understanding the fundamental concepts discussed in this paper. There are essential ideas, which shape and draw an insert to the relationship of critical elements studied. The key knowledge shared in this literature review is related to the concept of sustainability specifically the Triple Bottom Line (environment, economic and social) aspects. It proceeds with initiatives of companies towards corporate sustainability, where the necessity of including sustainability into a business model is presented. The chapter runs into making a comparison between corporate sustainability and stock market performance of the riskier asset. It also identifies the critical variables to be considered when finding the relationship between stock returns and CS.

2.1 Sustainability

In the recent years, the world has undergone a paradigm shift from mobilizing resources for environmental protection towards sustainability. This ideological change in the society is triggered by the needs to obtain a balance between the three dimensions of environment, economy and social well-being (Finkbeiner, 2010). These elements of sustainability are also known as pillars of sustainability; The Figure 2.1 indicates the pillars of sustainability.

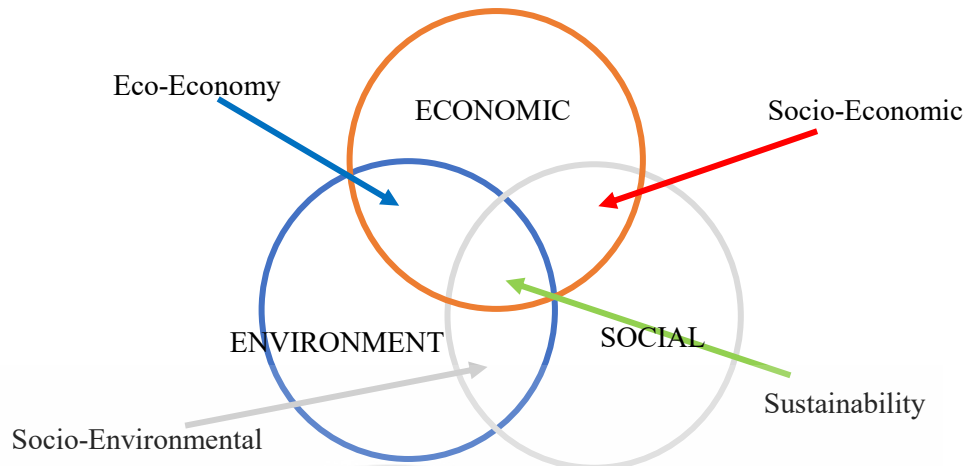


Figure 2.1 Sustainability pillars

The Brundtland reports defined sustainable development as better quality of life now and for generations to come. Furthermore, the idea was elaborated and widened the scope of the concepts to cover the three pillars of sustainability by the UN Conference on Environment and Development held in Rio in 1992 (UNCED, 1992). In 2002 the World summit on 'Sustainable Development, which was held in Johannesburg South Africa. It introduced the concepts of sustainable consumption and production. The summit changed international community mindset. Nations are abiding by agreements such as the agreements of investment in recycling and reuse of technology. Also, it was the foundation of the famous agreement on global warming to reduce greenhouse gases called Kyoto protocol. Another agreement is the Paris agreement on climate change which comes with 10000 new climate initiatives. Figure 2.2 presents COP21 Major outcomes of Paris agreement.



Figure 2.2 COP21 Major outcomes of the Paris Agreement

Source: World Resources Institute (2016)

Thus, laws and regulations have been enforced in the last few years to promote environmental sustainability. One of such regulations is the European directives on waste management and electronic equipment and many states in the US also have enforced environmental laws (Bose, 2011). Currently, companies are implementing sustainability, which involves a change in technological use, supply chain strategy and production procedures. These changes are applied either to influence customer satisfaction of sustainable products, company reputations and sometimes can be due to economic needs.

Companies are including sustainable model into their business, as the global market is estimated to grow to three billion of consumers by 2030 (Ellen MacArthur Foundation, 2015). The business model that considers sustainability becomes necessity approach. Models such as service design model would profoundly sound than before. This material is reserved for educational use only, not allowed for commercial use.

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Sharon (2017) interlinked sustainable Business Model Innovation and Service Design.

Table 2.1 narrates the connection between business model innovation and service design.

Table 2.1 Conceptual comparison of sustainable Business Model Innovation and Service Design

Element	Sustainable Business Model Innovation	Service Design
Goal-based	Vocalizes strategic value for stakeholders in a business context	Uncover, articulate and deliver strategic value for multiple customers/users based on relationships and experiences
	Articulates strategic value for stakeholders in a business environment	Focus: user-centered uncovering multiple firms' needs in the context of social value and traditional financial capital
Processual	Transitional: initiate, ideate, integrate, implement	Iterative: design, evaluate, measure and redesign
	Systemic: the business model unit fosters a systems approach	Systemic: the service design approach is derived to tackle wicked problems involving multiple needs and contexts
Functional	Stakeholder-based	User-centered
	Strategic decision-making	Strategic as well as operational decision-making
	Resource, social, economic value	Social, economic value

Source: Sharon P., and Bockena N (2017). Sustainable Business Models through Service Design. *Procedia Manufacturing*, 292 – 299.

2.2 Corporate Sustainability Practices

Corporates Sustainability (CS) is a business approach that generates long-term shareholder value by embracing opportunities and managing risks deriving from economic, environmental and social development (United Nation Global Compact, 2014). The most cited illustration of CS is built on the Brundtland report, which defines sustainable development as “the development that fulfills the needs of the present’s generation without compromising the ability of the future generations to meet their own

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needs” (WCED, 1987). Hence, CS meets the needs of company stakeholders without compromising its ability to meet the needs of future stakeholders as well (Dyllick, 2002). A similar interpretation was provided by Elkington (1998), and Lourenco et al. (2012) affirmed that the success of companies in the future would depend on the ability to satisfy not only the traditional bottom line of profitability but also the lines related to environmental and social issues. There is a belief that sustainability practices could lower substantial costs of capital and generate a high return in the long run (Unruh et al., 2016).

Even though based on traditional perspectives, companies are engaging in socially responsible activities only and if it allows value to be created (Lourenco et al., 2012). Sometimes, endorsing sustainability practice is not only attached to profitability but also related to firm’s reputations and moral obligations (Santis, 2016; Siegel, 2009). Corporates may receive pressure from stakeholders and non-stakeholders to include sustainability practices in their operations (Searcy and Elkhawas, 2012).

Furthermore, the analysis conducted by several researchers to find a relationship between corporate sustainability and corporate performance confirms the idea that they are positively linked (Lourenco, 2012). The study conducted by Surroca (2010) found that there was no relationship between CS and financial performance, rather than an indirect connection that relies on mediating effect of firms an intangible resource. Moreover, the International Finance Corporation's (IFC) report (2011) states that companies with good ESG performances may benefit by reducing their cost and risks management. Therefore, that may help by reducing their cost and risks, strengthening their brands and improving their growth thus providing added value to their investors. Bose (2011) conducted a study to find the difference of companies decides to adopt green supply chain and non-green companies the study found that green companies enjoyed the better financial performance with positive stock market performance.

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According to Jianu (2015) companies promoting business by sustainability principles have become more critical in the global economy. Bezares (2016) stated that sustainable firms enhance their long-term efficiency, which eventually leads to an overall increase in shareholder wealth. There is an emphasis on companies meeting sustainability criteria can have strong resistance to stock market crash. On the other hand, the study of Lo and Sheu (2007) reports that companies with right sustainable development strategies valued by their inclusion in the ethical index. These firms obtained rewards from investors with higher stock market valuation.

2.3 Sustainability Reporting

Sustainability reporting is a favorite technique used to measure sustainability practices. It has been used mostly in accounting field to quantify sustainability practices (Searcy and Elkhawas, 2012). Sustainability reporting has been studied with an emphasis on practices of multinational companies (Kolk, 2004).

It has built the foundation on the best way for companies to assess their investment impact and strategy on sustainability away from building images and reputation. Adhering to sustainability reporting, a growing number of large corporations voluntarily rely on the guidance provided by the Global Reporting Initiative (GRI, 2016). All these actions give companies chances to show their participation in CS practices.

Therefore, sustainability reporting has become the key for governments agency, businesses and other stakeholders such as NGOs to show contributions to economic, social, environmental and human rights issues. Specifically, for organizations sustainability reporting adds value in several areas. It builds trust and transparency, improves processes and systems internal management and decision-making processes can

be examined and developed, leads to cost reductions by measuring and monitoring such issues as energy consumption, materials use, and waste GRI report (2017).

Measuring sustainability performance can ensure companies to meet regulatory requirements effectively, avoid costly breaches, and competitive advantage companies. There are over 3,400 publicly traded companies invited each year to participate in RobecoSAM's Corporate Sustainability Assessment (CSA) among of these, the most significant 2,500 global companies by market capitalization are qualified for inclusion in the flagship DJSI World. Additional companies qualify for the growing family of regional and country-specific sustainability indices, such as the DJSI North America, Europe, Asia Pacific and Emerging Markets (DJSI, 2017).

The Stock Exchange of Thailand (SET) has been battling for the Thai capital market's sustainable development to enhance its competitiveness in the global playing field and support the market value chain's growth with quality. This initiative follows the United Nations' Sustainable Development Goals (SDGs) announced in 2015 to encourage and engage the global population in contributing to sustainable development of the economy, society, and environment. The capital market played a crucial role in helping the world to achieve the SDGs (Stock Exchange of Thailand, 2015).

2.4 Analysis of Stock Market Performance

Stock markets are a little like auction houses representatives of buyers and sellers meet to agree on a price for a trade (Kansas, 2005). The investment fundamentals are considering different characteristics such as risk, returns, safety, liquidity, the stability of the purchasing power, income stability, tax benefits and growth of capital. For stock market performance the mostly considered characteristics are risk and returns. When a company expands its investment, sells all or part of this ownership as stock or shares.

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Stocks represent the ownership of a company and is used as an option to debts of company investment.

According to Edward (2007), there are two methods for stock market analysis used to answers trader’s problem of what and when they should invest. The most standard method is referred to as the fundamental or statistical, and the other one is technical analysis.

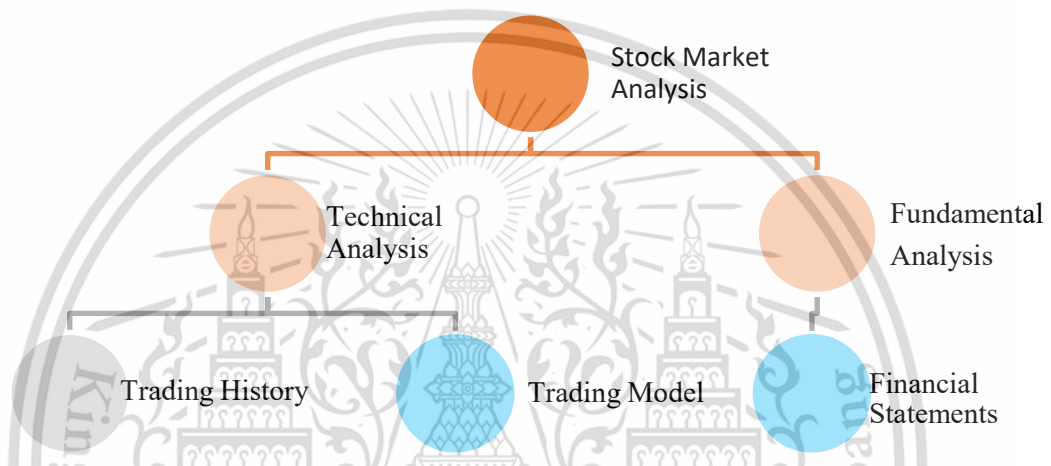


Figure 2.3 Methods of stock markets performance analysis

The stock market fundamentalist depends on statistics. It evaluates the auditors’ reports, the profit-and-loss statements, the quarterly balance sheets, the dividend records, and policies of the companies whose shares were under observation. Furthermore, the analyzes focus on sales data, managerial ability, plant capacity, the competition to bank and treasury reports, production indexes, price statistics, and crop forecasts to gauge the state of business in general and reads the daily news carefully to arrive at an estimate of future business conditions. In contrast, the technical analysis is the science of recording, usually in graphic form, the actual history of trading (price changes, the volume of transactions, etc.) in a particular stock or in “the Averages” and then deducing from that pictured history the probable future trend. The technical analysis employs models and

trading rules based on price and volume transformations, such as the relative strength index, moving averages, regressions, inter-market and intra-market price correlations, cycles or, classically, through recognition of chart patterns (Edward, 2007).

Technical analysis is commonly used among traders and financial professionals and is very often used by active day traders, market makers, and pit traders, in the foreign exchange markets, its use may be more widespread than fundamental analysis. Technical analysis is more applicable to the international market.

Dow Theory on stock price movement is a form of technical analysis that includes some aspects of sector rotation. The theory proposes six basic principles of stock market analysis which are:

- The market has three movements; main movement, medium swing, short swing
- Market trends have three phases; accumulation phase, public participation phase, and a distribution phase
- The stock market discounts all news
- Stock market averages must confirm each other
- Trends are confirmed by volume
- Trends appear until definitive signals prove that they have ended

Many technical analysts consider Dow Theory's definition of a pattern and its insistence on studying price action as the central premises of modern technical analysis.

2.5 Corporate Sustainability and Stock Markets Performance

In addition to traditional measures for stock value such as earning and book value, CS can also influence investor's decision for investment. Hiran Radeesri, an expert on

Corporate Governance and Social Responsibility at SET, pointed out the importance of Corporate Governance (CG) and Corporate Social Responsibility (CSR). He stated that

“If the listed companies are below standard or lack of credibility, no one would be encouraged to invest. The companies should also transparently disclose their Environmental, Social and Governance (ESG) performance information so that the investors can have the confidence in making long-term investment decisions” (Stock Exchange of Thailand, 2015).



Figure 2.4 Daily trading at stock exchange of Thailand

Source: Stock Exchange of Thailand (2016)

For this reason, the SD Indexes such as DJSI and FTSE4Good offer information for the investors to assess corporations with their sustainability performance. It is a vital information resource for the investors who are interested in companies with an emphasis on sustainability (Santis, 2016). Thus, some investment strategies are developed by using stock screening based on ESG practices (Mollet and Ziegler, 2004).

Torrea (2015) also concluded that investing in companies listed in SD Indexes results in higher returns compared to the general markets. However, there is no evidence

that engaging in sustainability practices has a direct impact on company's profitability. Nonetheless, the emphasize was made that sustainability should still be considered since it might be connected to reputation building or loyalty maintenance (Mollet and Ziegler, 2006).

2.6 Research Hypotheses

Several theories have emerged to explain the relationship between company's adoption of sustainability management and stock returns. Some studies found that CS has a positive effect on company's stakeholders to support its operations. As a result, it should help increase the wealth of company's shareholders (Bezares et al., 2016).

Curran and Moran (2007) studied the impact of inclusion and deletion from SD Index. They found that stock's status on the index has a direct variation to the stock price. For example, once the index announces the inclusion of the stock, its price reacts positively (Stekelenberg et al., 2015; Oberndorfer et al., 2013).

There is a high possibility of organizations considering sustainability strategy in their operations to create shareholder values and yield revenue for managing risks (Adner, 2006). Bose and Pal (2011) highlighted that inclusion of sustainability strategy into SD Indexes can bring about positive signals for corporate performance. These arguments above can be summarized into the following hypothesis.

Hypothesis 1: THSI listed companies generate a high average excess return

A study conducted by Campbell (2003) illustrated that the periods of high-risk aversion and low-risk premium are associated with times of financial distress and high periods of market volatility. During these times, investors pay more attention towards companies of sound sustainability practices. Similarly, Bezares et al. (2016) pointed that investors are interested in investing stocks in companies with less volatility which makes

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it easy for stock value predictions and minimization of risks. In this view, THSI listed companies have a higher possibility of reducing stock volatility and attracts prospective investors, who are willing to invest in SD Indexes. These findings lead to the second hypothesis.

Hypothesis 2: The relationship between THSI listed companies and stock return volatility is negative and substantial.



CHAPTER 3

RESEARCH METHODOLOGY

This chapter describes the research strategy, the research method, the research approach, the methods of data collection, the selection of the sample, the research process, the type of data analysis (Kothari, 2004). This chapter consists of four sections, which contribute to the description of the research methodology. The first sections represent the sources of data collection and sampling procedures. The next section presents data analysis. Finally, the last section is devoted to portfolio measurement techniques.

3.1 Data Collection

Financial data such as historical stock prices were collected from the SET database and corporate financial statements. The collected data are related to stock returns variable whereas dummy variable is used for CS practices. SET was contacted directly to request for unavailable data in the prior resources. This study considers all companies listed in SET100 index. Based on the data in 2016, out of these 100 companies, 54 of them are also listed in the THSI. The data is scoped to cover the period of 39 months starting from May 2013 to May 2017.

However, the total samples were reduced to 83 companies including 40 THSI-listed and 43 non-THSI listed companies in the SET100. The decrease in the sample is due to the following reasons. First, financial firms such as bank and insurance companies were not included due to their different capital structure from other companies. Second, companies in Market for Alternative Investment (MAI) index was excluded due to their capital size. The total number of companies studied are listed in appendix A and B. Based

on the survey; smaller companies give less contribution to environmental issues compared to larger companies (Adner, 2006).

It should be noted that, even though THSI was launched in 2015, this study scopes company samples and data back to 2013. It is assumed that companies selected to be included in THSI might have performed well regarding sustainability practices before 2015 to be included in the scheme. Thus, descriptive statistics of the final sample by industry group is shown in Table 3.1.

Table 3.1 Sample size

THSI	Non THSI	Sample Size	Total Sample
40	43	83	117

3.2 Market Model – CAPM

The study used Capital Asset Pricing Model (CAPM) Three Factor developed by French and Fama (1993) for data analysis. This model is based initially on the One Factor CAPM, an idealized model that portrays how financial markets price securities to determine expected returns on capital investment (Sharpe, 1964). CAPM provides a better methodology for quantifying risks and translating those risks into estimated equity returns (Lopez et al., 2007). CAPM determines the beta of each company. Beta (β) is the coefficient of a specific risk of each stock in relation to overall market indexes (Schroder, 2007).

One Factor CAPM was used by Schroder (2007), Blanchett (2010), and Torrea (2015) to test the performance of Sustainable Investment (SI) against similar non-sustainable investment alternatives. The results showed no significant difference between the two investment schemes. Also, other studies used Jensen's (α) and market risk (β), the two coefficients are the components of CAPM to find the relationship between CS

and stock returns. The results showed that investing in CS bring about low volatility and higher stock returns (Mollet and Ziegler, 2006; Schaeffer, 2012; Bezares et al., 2016). CAPM Three Factor was developed with the aim to minimize biases related to size and value.

When $\beta = 1$, the expected returns of an asset are given by the risk premium of the portfolio. When $\beta > 1$, the asset is more volatile, which indicates return aggressiveness to attract investors. The case of $\beta < 1$ means a less volatile asset, which is suitable for a defensive position to reflect systematic risks of each company. Positive (α) indicates favorable expected returns. The One Factor CAPM is presented as Equation 3.1

$$(R_{pt} - R_f) = \alpha_p + \beta (R_{mt} - R_{ft}) + \varepsilon_{pt} \quad (1)$$

Where,

$R_{pt} - R_f$ = the rate of cost of equity during the period of study for the portfolio

R_{mt} = the rate of return of market index at SET/ risk premium or systematic risk

R_{ft} = the risk-free rate of return used by Thailand treasury bill index at times

β = the coefficient of specific risk to the stock in relation to an overall market index

ε_{pt} = the stochastic disturbance term that captures idiosyncratic risk

3.3 Size and Returns

The samples are categorized by market capitalization and book-to-market value ratios. Small companies (shown as S) are those, which have market capitalization value less than the market's average value and big companies (shown as B) are those, which have market capitalization value higher than the average.

The total sample is classified into six portfolios as indicated in Table 3.3.1.

Companies are ranked by size based on market capitalization from January to December

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2016 with the smallest 50 percent and biggest 50 percent of stocks designated into two groups Small (S) and Big (B).

Low book-to-market companies (indicated as L) are so-called growth companies and have book-to-market value ratio below 30 percent. The middle book-to-market companies (shown as M) have book-to-market value ratio in the middle 40 percent. High book-to-market companies (indicated as H) are so-called value companies and have book-to-market value ratio in the top 30 percent.

Table 3.2 Sample size based on portfolio categorization by market capitalization and book-to-market value.

Portfolio	Low (L)	Medium (M)	High (H)	Total
Small (S)	41	15	4	60
Big (B)	14	6	3	23
Total	55	21	7	83

The linkage of size-groups and three book-to-market groups formulates two portfolios which is Small Minus Big (SMB) considering size factor and High Minus Low (HML) considering return factor. The variable SMB represents the average monthly returns of the small group (SL, SM and, SH) and HML represents the average returns of the large group (BL, BM and, BH) as indicated in Table 3.3.

$$\text{SMB} = \text{Small} - \text{Big}$$

$$\text{SMB} = \frac{1}{3}(\text{SL} + \text{SM} + \text{SH}) - \frac{1}{3}(\text{BL} + \text{BM} + \text{BH}) \quad (2)$$

The variable HML represents the risk factor for equity value. HML is different for each month for the average returns of the high group (SH and BH) and the average returns of the low group (SL and BL).

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HML = High – Low

$$HLM = \frac{1}{2}(SH + BH) - \frac{1}{2}(SL + BL) \quad (3)$$

Fama and French hypothesized that the return of a big-size portfolio is less than a small-size portfolio. This hypothesis implies that SMB coefficient should be positive. Formulation of these portfolios was also used by (Sabin et al., 2016; Ajlouni, and, Khasawneh, 2017) to find the returns of big and small firms. The regression model for the Three-Factor model is as follow:

$$(R_{pt} - R_f) = \alpha_p + \beta_1 (R_{mt} - R_{ft}) + \beta_2 SMB + \beta_3 HML + \varepsilon_{pt} \quad (4)$$

Where,

$R_{pt} - R_f$ = the rate of cost of equity during the period of study for the portfolio

R_{mt} = the rate of return of market index at SET/ risk premium or systematic risk

R_{ft} = the risk-free rate of return used by Thailand treasury bill index at times

β = the coefficient of specific risk to the stock in relation to an overall market index

ε_{pt} = the stochastic disturbance term that captures idiosyncratic risk

HML is Small Minus Big

SMB is High Minus Low

Table 3.3 The average of stock returns and Standard Deviation (SD) of Low, Medium and High portfolio

Portfolio	Average Return	SD	Average Return	SD
SL	0.04	0.20	30.80%	39.55%
SM	0.02	0.07	15.39%	13.12%
SH	0.05	0.11	32.67%	20.63%
BL	0.01	0.04	5.27%	7.75%
BM	0.01	0.05	7.31%	9.70%
BH	0.01	0.05	8.56%	9.24%
TOTAL	0.15	0.52	100.00%	100.00%

Table 3.3 gives the distributional properties of returns of the six portfolios, designated by capitalization and book-to-market ratio. S = Small capitalization, B = Big capitalization. L = Low book-to-market ratio, M = Middle book-to-market ratio, H = High book-to-market ratio. The data reflect the sample period from May 2013 to May 2017. From monthly returns of 39 months.

Also, this study considers the average risk-free rate (RF) to be 2.72% given by Thailand treasury bond covering the past ten years and the average market risk premium (MRP) of 8.40% obtained from a survey conducted by (Pablo et al., 2016). The results obtained from Pablo's survey is similar to the one estimated by Bank of Thailand (BOT).

3.4 Portfolio Performance Measurement

The study uses Sharpe ratio, Treynor ratio, and Jensen ratio to measure portfolio performance. Jensen ratio is a measure of the absolute portfolio performance. While Treynor ratio is a measure of portfolio performance based on stock volatility and Sharpe

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ratio uses the standard deviation of relative portfolio performance. A portfolio has better performance if the ratios show positive values and vice versa.

Sharpe ratio

It is the most straightforward risk-adjusted performance measure (Sharpe, 1964). The Sharpe ratio measures the degree to which a portfolio can yield a return an excess of the risk-free return to cash, per unit of risk. It represents the differential return of a portfolio by a unit of total risk using standard deviation, and if the ratio is higher for the fund, it performs better than the benchmark, as shown in the equation 5.

$$\text{Sharpe ratio} = \frac{E(R_p) - RF}{SD} \quad (5)$$

Where $E(R_p)$ is the portfolio's return; RF is the risk-free return; and SD is the standard deviation of the portfolio's returns. While,

Treynor ratio

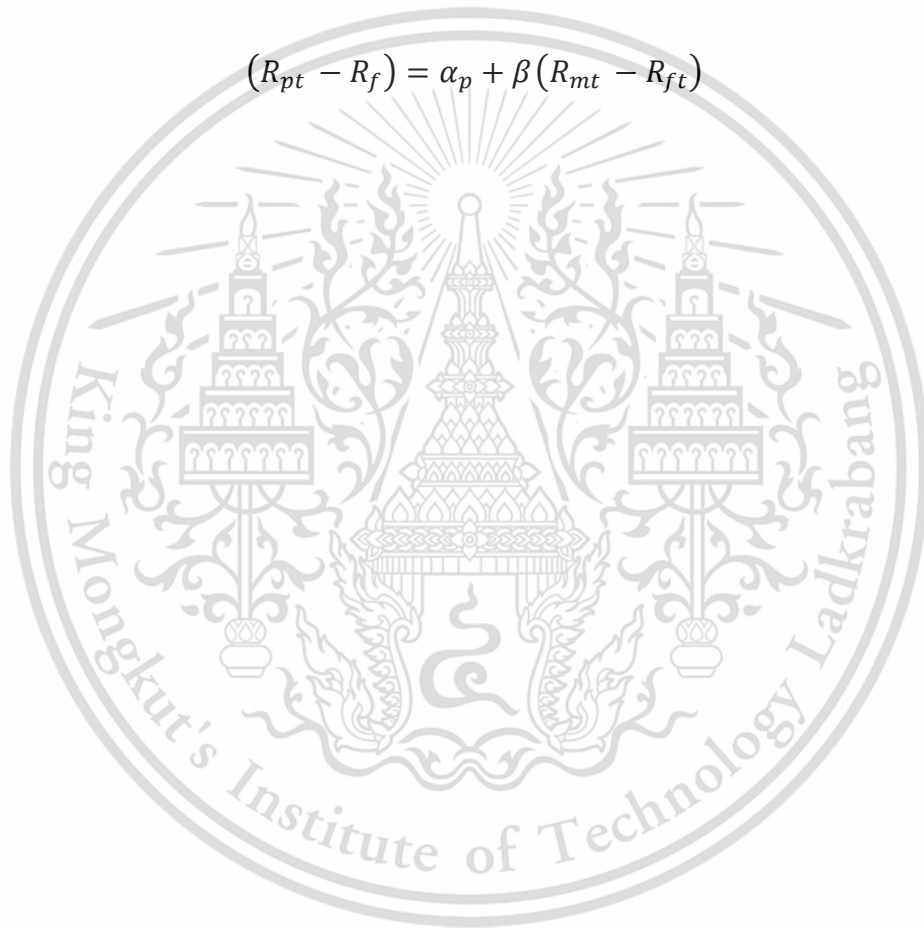
Treynor's measure Treynor (1965) represents the differential return of a portfolio by a unit of systematic risk (β_i). Like the Sharpe ratio, a higher value of the Treynor ratio suggests better performance. Unlike the Sharpe ratio, the excess return is normalized relative to the systematic risk or beta as shown in equation 6.

$$\text{Treynor ratio} = \frac{E(R_p) - RF}{\beta_i} \quad (6)$$

Jensen ratio

Alpha is the most well-known of the classical measures of investment performance. The most convenient way to define Jensen's alphas is as the intercept For Jensen ratio measures an absolute portfolio performance (Jensen, 1968). The Jensen ratio is shown in the equation 7. Jensen's alpha is defined as the differential between the return on the portfolio in excess of the risk-free. It is derived from CAPM.

$$(R_{pt} - R_f) = \alpha_p + \beta(R_{mt} - R_{ft}) \quad (7)$$



CHAPTER 4

RESULTS AND DISCUSSIONS

This chapter presents analysis and diagnosis of data obtained from the previous section. It contains an analysis of the crucial elements available in this study such as descriptive statistical analysis, the Three Factor CAPM, correlation analysis, and portfolio performance analysis.

4.1 Descriptive Statistical Analysis

The descriptive statistical analysis is used to identify average return of THSI and non-THSI listed companies. It is done to prove the hypotheses of this study. Using a CAPM the average excess return and stock volatility of each group of companies is generated. The statistical significance of connections among selected variables was determined using the t-test, and the level of significance was set at 0.05.

Table 4.1 presents the average excess returns of alpha -0.070 and -0.020 for THSI and non-THSI listed companies, respectively. Based on the results, both THSI and non-THSI listed companies yielded an average rate of excess returns below the given market risk. The results deviate from Hypothesis I such that the companies adopting sustainability practices produce high average excess returns than the general market. Basically, it is said that the portfolio has better performance if the value of alpha is positive.

THSI listed companies of SMB portfolio demonstrates lower stocks volatility of an average beta of 0.152 compared to non-THSI listed companies which have an average beta of 1.426. These results support the argument that companies decide to go green have

low stock market volatility. The market model assumes that when a beta is below one, the portfolio has low stock return volatility.

The beta of HML portfolio of THSI listed companies is lower than non-THSI of 0.048 and 0.365, respectively. Although THSI and non-THSI listed companies have low stock volatility. THSI listed companies demonstrate low stocks volatility with a difference of beta 0.317, which is equivalent to 77 percent lower than non-THSI listed companies. The results provide more advantage to sustainable companies to attract investors wishing to invest in a low-risk company.

Table 4.1 A summary of descriptive statistics of average and SD of the excess returns and stock returns volatility of the THSI and non-THSI listed companies.

	THSI		NON-THSI	
	Average	SD	Average	SD
α	-0.070	0.150	-0.020	0.258
β SMB	0.152	0.400	0.699	0.838
β HML	0.048	0.258	0.365	0.498
β MRP	1.388	2.849	0.370	4.888

The study conducted analysis on the four-important concept of investors decision related to stock market performance. These investment concepts are the cost of equity, stock returns, excess returns, and stock volatility. Cost of equity is the return to compensate for the risk they undertake by investing their capital. Stock market returns are the returns that the investors generate out of the stock market. The excess returns are investment returns from security or portfolio that exceed the riskless rate on security. Beta is a measure of the volatility, or systematic risk, of a security or a portfolio in comparison to the general market.

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Table 4.2 shows the average rates of equity cost of 0.1519 and 1.6167 for THSI and non-listed THSI companies, respectively. As hypothesized, the companies adopting sustainability practices have a lower value of equity than the average general market. The results indicate that non-THSI listed companies have higher average rates of cost of equity for compensating risks than THSI listed companies. The results suggest a high average return of 0.231 in non-THSI listed companies an average return of 0.0083 of the THSI listed companies. The results imply that, on average, THSI companies yield less return than non-listed THSI companies. However, THSI listed companies were considered having a low cost of equity. Thus, these companies compensate low rate cost of equity of risk asset as compared to non-sustainable companies. The values of beta and alpha are similar to those discussed in Table 4.1.

Table 4.2 Cost of equity and the stock return of the THSI and non-THSI listed companies

	α	β_{SMB}	β_{HML}	β_{MRP}	$R_{PT} - R_F$	Returns
THSI	-0.0705	0.1521	0.0479	1.3881	0.1519	0.0083
NON-THSI	-0.020	0.6985	0.3645	0.3696	1.6167	0.0231

Table 4.2 presents an excess return (α), the beta of the portfolios designated by size and the return of SMB = Small Minus Big and HML = High Minus, respectively. RMP – RF is the cost of equity of the THSI listed and non-THSI listed companies.

There is a healthy relationship between volatility and stock market performance. Volatility tends to go down as the average stock market increases and rise as the stock market falls. Figure 4.1 shows the trends of stock return for both THSI listed and non-

THSI listed companies stock volatility for 39 months. The non-THSI listed companies show slightly high volatility compared to the THSI listed companies.

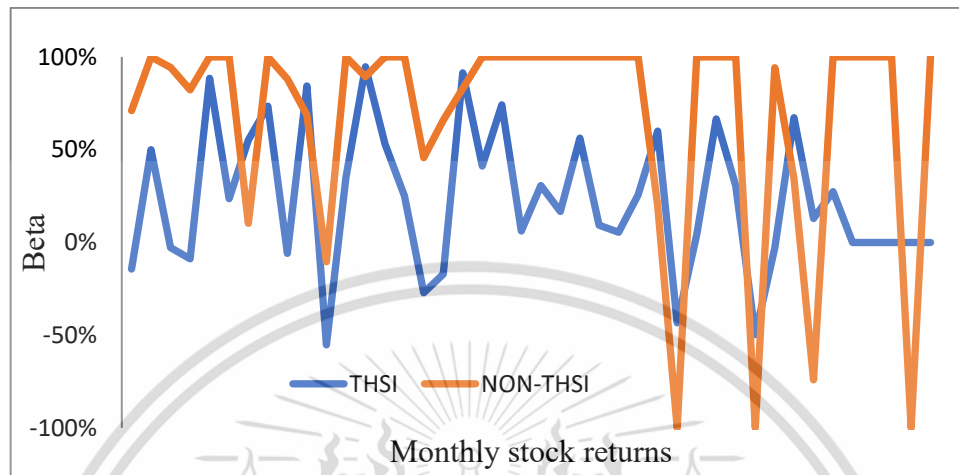


Figure 4.1 Trends of stock return for both THSI listed and non-THSI listed companies stock volatility for 39 months.

In this study, the size and value of company were considered to determine the trend of stock return volatility between THSI listed and non-THSI listed companies obtained from Three Factor Model. Figure 4.2 shows the patterns of stock return volatility in THSI listed and non-THSI listed companies for 39 months. Non-THSI listed companies show slightly high volatility with the frequency of sharp rise and fall as compared to the THSI listed companies. The SMB and HML portfolio of THSI listed companies reveal lower volatility. Where, the size portfolio shows low volatility as compared to value portfolio and, could be more appealing to investors.

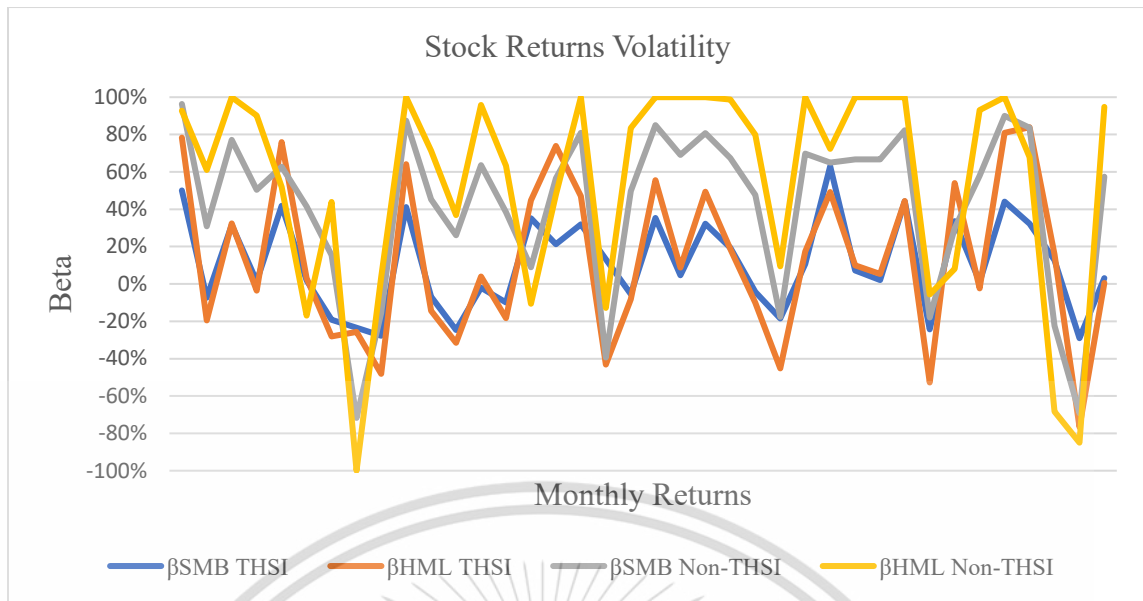


Figure 4.2 Trends of stock return volatility of THSI and non-THSI listed companies of the SMB and HML portfolio for 39 months.

4.2 Three-Factor Model Regression

The Three-Factor Model's first factor describes how the asset corresponds to the market portfolio. SMB coefficient measures the historical excess return of small caps over large caps companies. HML factor measures the historical excess returns of value stocks over growth stocks.

Table 4.3 describes the estimates from the regression model for each of the six portfolios. The results show that values of alpha of all portfolios are positive, which implies that there is a favorable yield which is higher than the given market risk. These results pinpoint that Thai market in all six portfolios could yield a high excess return of the given market risk. The stock returns of this portfolio are listed in Appendix C.

In case of stocks volatility, the small portfolios have a high average beta of 1.287, which is above the range of beta one digit for SL and SH. The alpha of 0.720 in the SM is within range but higher than big size portfolios. BL, BM, and BH have the low volatility

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of beta below 1. This means that the value portfolios have lower volatility than small size portfolios, thus investing in these portfolios have a lower risk.

Table 4.3 Regression results of the Three-factor CAPM

Portfolio	α	βSMB	βHML
SL	0.010	1.287	-1.150
SM	0.002	0.720	0.428
SH	0.010	1.287	0.850
BL	0.005	0.102	0.033
BM	0.005	0.185	0.127
BH	0.012	0.008	-0.032

Table 4.3 presents the value of beta (β) and alpha (α) of the six portfolios, which reflect the sample of 39 months. The portfolios are designated by capitalization and book-to-market ratio. S = Small capitalization, B = Big capitalization, L = Low book-to-market ratio, M = Middle book-to-market ratio, and H = High book-to-market ratio.

The regression results presented in Table 4.4 include stock returns of industry group variable factor. The analysis was carried out to find the influence of industry group in the excess return and stock volatility. The study found that the alphas of all groups were positive with highest yields in consumer products. The betas of SMB and HML portfolio of the THSI listed companies were lower than non-THSI listed companies. However, consumer product companies tend to be more volatile with the highest beta. The mixed results shown in Table 4.2.2 indicate that industrial groups can influence excess return and stock return volatility. The stock returns of these industry group are listed in appendix D

Table 4.4 Coefficient alpha and a beta of the CAPM Three factor model of the industry group inclusion

Industry group	α	β_{SMB}	β_{HML}	THSI	Non THSI	Total
Agro & Food Industry	0.088	-0.247	-0.066	3	0	3
Consumer Products	38.936	13.031	22.427	2	5	7
Industrials	0.219	-0.033	0.058	6	0	6
Property & Construction	0.151	0.204	0.159	3	15	18
Resources	0.165	0.119	0.138	11	10	21
Services	0.084	0.103	0.128	4	16	20
Technology	0.234	0.077	0.067	8	4	12

4.3 Excess Returns, Stock Volatility, and CS

The study hypothesizes that investing in THSI listed companies would lead to higher average excess returns and lower stock returns volatility than investing in non-THSI listed companies. The findings indicate that CS has a negative correlation with a coefficient beta of SMB and HML portfolios as shown in Table 4.5 This result implies that investing in CS management could lead to low stock volatility. The negative correlation results pinpoint that CS have impacts on SMB and HML portfolios regarding stocks volatility. However, there was no relationship between CS and excess returns. Nevertheless, there was a negative correlation between the CS and excess returns. Therefore, the result is contradicting with Hypothesis I. The deviation could be due to little impacts contributed by CS investment on the excess returns. These findings correspond with the study of Schroder (2007) which found that there was no significant difference between sustainable investment and the general market.

Table 4.5 Correlation results

	α	β SMB	β HML	β MRP	CS
α	1				
β SMB	0.480	1.000			
β HML	0.404	0.939	1.000		
β MRP	-0.996	-0.501	-0.419	1.000	
CS	-0.071	-0.377	-0.368	0.072	1.000

Table 4.5 presents correlations results of the monthly returns of the six portfolios. The portfolios are designated by size and the return of SMB = Small Minus Big and HML = High Minus respectively. Alpha (α) is the excess return of the portfolio, Beta (β) is the coefficient of stock volatility, and CS indicates corporate sustainability.

4.4 Portfolio Performance Measurement

The previous sections of this chapter used beta and alpha to determine the portfolio stock performance as used in the CAPM. However, the study uses extra measures for supplemental results. These measures are called ratios, which include Jensen ratio, Sharpe ratio, and Treynor ratio.

Table 4.6 shows the Jensen ratio of -0.030 and -0.040 for THSI and non-THSI listed companies, respectively. Also, it shows a positive result of a Treynor ratio with 0.02 in all portfolios, and Sharpe ratio indicates a value of 0.82 for THSI listed companies and negative value of -0.30 for the non-THSI listed companies. Though, it should be noted that the positive ratio indicates better performance and vice versa. It can be concluded that THSI listed companies have better stock performance than non-THSI listed companies.

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Table 4.6 Stock market performance measurement

Companies	Jensen ratio	Treynor ratio	Sharpe ratio
THSI listed companies	-0.030	0.020	0.820
Non-THSI listed companies	-0.040	0.020	-0.300



CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

There is an increase in the number of companies adopting sustainable supply chain strategy in their business. It is seen in Small and Medium Enterprises (SMEs) to large multinational companies. It is mainly due to the impact that a sustainable supply chain can have on the overall well-being of the society and the growth of the business. The inclusion of sustainability strategy in the business model is mostly influenced by a need for customer satisfaction of sustainable products, company reputations and sometimes can be due to economic needs. This study proves that adopting sustainable supply chain strategy into the business leads to better stock market performance. This study compares the stock market performance of THSI and non-THSI listed companies to demonstrate the impact of adopting sustainability practices by the companies. It focuses on testing whether adoption of CS practices leads to favorable excess returns and reduces stocks volatility of riskier assets.

The first objective of this study is to investigate whether adoption of sustainability practice generates a high excess return. The results show that this is not the case. The study found that THSI and non-THSI listed companies generate an excess return below the risk of the given market. The findings also identify the negative relationship between CS and excess return. Also, it found that THSI listed companies yield a low average of cost of equity compared to non-THSI listed companies. Investors of specific stocks might demand or request for higher risk compensation from non-THSI listed companies than THSI listed companies before making an investment decision. Based on the results, investing in THSI listed companies are expected to have better stock performance above the given market risk. Therefore, companies in THSI scheme should be more favorable

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for the investors. Thus, investing in THSI listed companies should attract more investors than investing in non-THSI listed companies.

The first objective leads to the second objective of whether the THSI listed companies have low stock return volatility than non-THSI listed companies. It is found that there is a relationship between adopting sustainability management and stock return volatility. The results show that THSI listed companies have lower stock return volatility, which makes them more predictable for the investors regarding strategic investment. The result implies that investing in CS management could lead to low stock returns volatility in Thai market. These findings are also aligned with the outcomes of Stekelenberg et al. (2015) and Mollet and Ziegler (2014), which were conducted in Germany and the US, respectively. It is particularly important for fund managers, who usually opt for less risky investment. With this justification, these assets with lower risks (a.k.a. THSI listed companies) would have a higher comparative advantage.

Finally, the third objective which was about the determination of the relationship between corporate sustainability and stock market performance. From the correlation test, the findings identify the negative relationship between CS and excess return. Investing in THSI listed companies might not generate excess returns above average market risks. While there was a negative correlation between beta of SMB and HML portfolios and CS. This finding implies that THSI listed companies have low stock volatility compared non-THSI listed companies. Supply chain practitioners and specialist can use the results of this study to improve the line of sustainable products, which seems to have comparative advantage than the others.

The results of this study are expected to build on current theory and arguments of the relationship between corporate sustainability and stock market performance. The findings of these studies highlight the benefits of companies practicing sustainability

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management. It has identified the benefits to be gained by companies and another stakeholder such government agency. These benefits are generated based on this study and previous work as follows.

- Sustainability is a critical aspect of firm's strategy, primarily because of the financial scandals and dropped of investors' confidence, trust, new market opportunities and positive reactions of capital markets. Since, it is strictly connected to the idea of firm's reputation (Fiora, 2007).
- The study encourages companies to participate in sustainability practice such as sustainability reporting, not only they would build their reputation and images of companies but also increase their cost of equity and can reduce stock returns volatility.
- The incidence related to lawsuits, cleanup costs in the environmental case, consumer boycotts, employee strikes over unsafe working conditions, potential fines, loss of reputation, NGOs' attacks and generates additional capital and goodwill, which mitigates possible negative assessments of future corporates action, can be minimized (Godfrey, 2009).
- This study would help traders and investors to know the need to integrate their business strategy into sustainable investment. It also helps enlighten the efforts to promote the understanding of sustainable development.
- Adopting sustainability strategy by companies attracts more investors in their business and boost their stock returns. The assumption that companies especially manufacturer contribute highly to greenhouses gases, adopting sustainable practice cuts the effects.

However, it should be noted that the results of this study are based on the analysis of SET100 stocks and THSI listed companies. Therefore, the results shall not be

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automatically applied to smaller companies such as the ones listed on the Market for Alternative Investment (MAI) index. Further studies are recommended to be conducted on these smaller companies. It is also emphasized that a study should be made in company's inclusion or deletion in ethical indexes such as THSI and its impact on stock returns.



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APPENDIX A

THSI Listed Companies (2016)

Companies Symbol	α	βSMB	βHML	β MRP	R_{PT}-R_F	Returns
AOT	-0.5635	0.6089	0.3441	10.3678	0.0099	0.0099
ADVANC	-0.0199	-0.0608	-0.1019	0.3254	0.4317	-0.0044
BCP	0.0391	0.3264	0.0103	-0.7890	-2.0508	0.0060
BAFS	-0.1988	0.0283	-0.1034	4.1410	-0.1988	0.0238
BANPU	0.0351	0.3130	0.2556	-0.5424	0.0351	0.0152
BWG	-0.0504	1.7557	1.0525	0.8969	-0.0504	0.0484
CPF	-0.3849	-0.4969	-0.2285	7.5810	0.0484	0.0072
CPN	-0.2310	-0.1289	-0.0125	4.6777	-16.171	0.0161
DELTA	-0.1886	-0.7072	-0.5210	3.7211	14.4491	-0.0096
DTAC	-0.0142	0.1753	0.0983	0.4589	-0.7814	0.0155
EASTW	-0.0889	-0.0439	-0.0476	1.7523	16.1647	0.0038
EGCO	-0.0142	0.1753	0.0983	0.4589	0.3238	0.0155
GLOW	-0.1378	-0.0838	-0.0237	2.7520	-2.7778	0.0073
HMPRO	-0.1604	-0.0400	0.1147	3.2267	2.8529	0.0116
INTUCH	-0.1167	-0.1096	-0.0933	2.1829	22.6622	-0.0029
IRPC	-0.0227	0.3043	0.0832	0.5792	1.3515	0.0170
IVL	-0.2539	0.0643	0.1594	5.1838	-7.1738	0.0260
MINT	-0.0047	0.1646	0.0773	0.2975	1.2760	0.0160
NYT	-0.0149	0.0718	-0.3070	0.3176	1.0285	0.0037
PCSGH	0.0354	-0.2233	-0.1100	-0.8044	-0.7932	-0.0142
PDI	0.2641	0.5582	0.3215	-4.7449	-12.756	0.0258
PM	0.1298	0.0866	0.0781	-2.2510	3.2710	0.0117

THSI Listed Companies (2016) (Continued)

Companies Symbol	α	β SMB	β HML	β MRP	RPT-RF	Returns
PPP	0.1529	1.1478	0.6097	-3.3132	-4.2072	0.0083
PPT	0.0113	0.2903	-0.0089	-0.1986	0.7363	0.0088
PTTEP	-0.1185	-0.1589	-0.2217	2.1340	-9.7450	-0.0089
PPTGC	-0.0898	-0.0745	-0.1083	1.6321	-1.7203	-0.0045
RATCH	-0.0066	0.2971	0.1841	0.0401	0.0042	0.0041
SC	0.0087	0.2129	-0.0468	-0.1858	-0.1127	0.0046
SCC	0.0542	0.4057	0.1506	-1.0658	7.4319	0.0086
CFRESH	-0.0936	0.0323	0.0495	1.8069	-0.9800	0.0042
SSSC	-0.2436	0.2518	0.0008	4.0784	-17.8557	-0.0179
SNC	-0.1562	-0.1382	-0.1609	2.8889	3.3803	-0.0054
SAT	0.2000	0.3034	0.1854	-3.8462	22.1210	0.0026
STA	-0.1387	0.0306	-0.0951	2.8555	-3.9608	0.0151
SPALI	-0.0849	0.3459	0.2887	1.7397	-7.6450	0.0185
THCOM	-0.0674	0.0490	0.0786	1.5001	6.5887	0.0145
TVO	-0.1387	0.0749	0.0181	2.9615	16.4030	0.0222
THCOM	-0.1578	-0.1384	-0.2269	2.8316	-27.0550	-0.0102
TOP	-0.0129	0.1381	-0.1120	0.3785	1.4160	0.0111
TTW	0.0249	0.2766	0.1857	-0.5025	0.1238	0.0059
Average	-0.0705	0.1521	0.0479	1.3881	0.1519	0.0083

APPENDIX B

Non-THSI Listed Companies (2016)

Companies Symbol	α	βSMB	βHML	β MRP	$R_{PT}-R_F$	Returns
AMATA	0.1826	0.2190	-0.0443	-3.3983	0.0065	0.0065
BCH	-0.2045	0.4206	0.2502	3.9557	5.2863	0.0197
BDMS	0.0910	0.4632	0.2361	-1.6984	-4.4481	0.0133
BEM	-0.4595	1.1441	0.8455	9.2784	-0.4595	0.0712
BLAND	-0.0081	-0.0990	-0.0804	0.4002	-0.0081	0.0105
BEAUTY	0.0389	1.1249	0.7383	-0.9591	0.0389	0.0201
BEC	-0.0616	-0.2531	-0.1553	0.9263	-0.0193	-0.0193
BIG	-0.4913	0.8336	0.4858	10.4359	-35.3562	0.0922
BTS	-0.1066	0.0998	0.0534	2.0928	8.1814	0.0085
BH	0.0866	0.3806	0.1655	-1.3421	2.3878	0.0256
CK	-0.2077	0.1962	0.0374	3.9519	36.4722	0.0097
CHG	-0.2079	1.1476	0.6175	3.3071	2.1116	0.0024
CKP	-0.0724	0.6273	0.2754	0.9792	-1.0067	-0.0019
CPALL	-0.1228	-0.3103	-0.1689	2.7615	2.3383	0.0163
EPG	0.0931	-0.0524	-0.0266	-1.3357	-13.8471	0.0199
GPSC	-0.0329	0.0208	0.1446	1.7923	3.8051	0.0640
GUNKUL	0.1683	2.3401	1.3605	-3.6502	5.4432	0.0402
HANA	0.2646	0.4661	0.2374	-4.4825	-17.1378	0.0377
ITD	0.0336	1.1211	0.5756	-0.9981	-3.2521	0.0124
KAMART	-0.0203	1.1139	0.6876	0.2636	0.4785	0.0260
KCE	0.0009	0.7286	0.4700	0.6533	1.9214	0.0570
LH	0.0338	0.1114	0.1092	-0.5116	-0.6920	0.0096
MAJOR	0.2145	1.4526	0.8402	-4.3184	15.9778	0.0249
PLAN B	-0.0541	0.0532	0.0251	1.3109	-5.9209	0.0177
PTG	0.2865	3.1821	1.8703	-5.6993	6.0021	0.0729

Non-THSI Listed Companies (2016) (continued)

Companies Symbol	α	β SMB	β HML	β MRP	RPT-RF	Returns
SAMART	0.0481	0.9446	0.5144	-1.3366	-0.3033	0.0037
SIRI	0.2373	0.2147	0.1009	-4.4326	-2.6585	0.0058
SGP	-0.2678	-0.2194	-0.1957	5.5705	-3.3158	0.0244
S	0.5168	1.6759	0.9813	-9.4988	41.5370	0.0560
STEC	-0.1842	0.0712	0.0788	3.6952	4.7855	0.0160
SPCG	-0.0459	-0.0004	-0.0241	0.6334	-3.6562	-0.0120
SPTI	-0.3138	-0.2246	-0.2702	5.7879	-8.0683	-0.0102
SAWAD	0.2410	0.0358	-0.0753	-3.8380	17.2310	0.0362
SUPER	0.3430	2.4794	1.6335	-5.8003	-22.7634	0.1039
THAI	-0.8145	-0.0207	-0.2065	15.3304	84.4831	0.0065
TTA	-0.2599	-0.3213	-0.2151	4.8534	-46.3625	-0.0090
TASCO	0.4354	2.1739	0.2938	-7.9070	-26.8456	0.0730
TRUE	0.0712	1.4330	0.9207	-1.8499	1.0298	0.0135
TTCL	-0.0626	0.57346	0.03383	0.5282	3.185	-0.0182
UNIQ	0.2715	1.1923	0.6862	-5.1082	21.3538	0.0320
VGI	-0.3324	-0.0707	0.2550	6.3341	-37.0719	0.0055
VIBHA	-0.2993	1.3832	0.8362	4.4215	69.1819	-0.0223
WHA	0.0912	1.2026	0.2243	-1.9299	-9.0561	0.0218
Average	-0.0204	0.6985	0.3645	0.3696	1.6167	0.0231

APPENDIX C

Portfolio average stock returns in period of 39 months

Date	SL	SM	SH	BL	BM	BH
May-17	-0.009	-0.006	0.010	0.005	0.030	0.002
Apr-17	0.013	0.015	0.044	-0.018	0.027	0.015
Mar-17	-0.012	0.021	-0.046	0.013	0.007	-0.005
Feb-17	0.016	-0.004	-0.041	0.027	0.034	0.030
Jan-17	-0.016	-0.043	-0.029	0.009	-0.177	0.008
Dec-16	0.040	0.001	-0.042	0.023	0.003	0.013
Nov-16	0.031	0.016	0.011	0.019	-0.009	-0.001
Oct-16	0.021	0.030	0.049	0.019	0.004	-0.006
Sep-16	0.033	0.046	0.118	0.006	-0.008	-0.001
Aug-16	-0.060	-0.045	-0.101	-0.034	-0.043	0.006
Jul-16	0.002	-0.018	0.015	0.016	0.023	0.019
Jun-16	0.040	0.063	0.159	0.050	0.009	0.055
May-16	0.049	0.046	0.218	-0.006	0.021	-0.035
Apr-16	0.020	0.019	0.195	0.042	0.070	0.046
Mar-16	0.020	0.051	0.105	0.025	-0.027	-0.049
Feb-16	0.042	0.058	0.066	0.120	0.078	0.034
Jan-16	0.017	0.019	0.037	0.016	0.040	0.019
Dec-15	0.018	-0.025	0.070	0.005	0.010	0.058
Nov-15	-0.055	0.011	0.011	-0.073	-0.006	-0.145
Oct-15	-0.031	0.045	0.011	-0.043	0.035	-0.060
Sep-15	0.043	0.041	0.059	0.047	0.041	0.026
Aug-15	0.018	0.012	0.058	-0.014	-0.007	-0.038
Jul-15	-0.050	0.048	-0.038	-0.058	-0.020	0.038
Jun-15	-0.056	-0.040	-0.026	-0.064	-0.011	0.057
May-15	0.041	0.013	0.052	0.002	0.026	0.037
Apr-15	-0.015	-0.146	-0.164	0.002	-0.016	0.056
Mar-15	1.264	0.025	0.025	0.027	0.010	0.042
Feb-15	0.238	0.311	0.505	0.071	0.127	0.103
Apr-14	0.003	0.046	0.083	-0.003	-0.006	0.060
Mar-14	0.052	0.089	0.076	0.027	0.065	0.032
Feb-14	0.074	0.076	0.130	0.034	0.017	0.087
Jan-14	0.037	0.078	0.119	0.034	0.051	0.023
Dec-13	-0.020	0.000	-0.054	-0.031	0.002	-0.020
Nov-13	-0.045	-0.010	0.050	-0.036	-0.066	-0.040
Oct-13	-0.032	-0.060	-0.053	-0.020	-0.033	-0.011
Sep-13	0.045	0.071	0.063	0.062	0.078	0.058
Aug-13	0.070	0.120	0.120	0.062	0.098	0.074
Jul-13	-0.070	-0.070	0.000	-0.071	-0.057	-0.087
Jun-13	-0.020	-0.030	-0.004	0.009	-0.003	-0.011
Average	0.045	0.022	0.048	0.008	0.011	0.012

APPENDIX D

Industry group average stock returns in period of 39 months

Date	Food Industry	Consumer	Industrial	Property	Resources	Services	Technology
May-17	-0.021	-3.010	0.002	-0.007	-0.009	0.007	0.010
Apr-17	0.011	-1.615	0.018	0.016	0.022	0.016	0.018
Mar-17	-0.017	-0.042	0.022	0.004	-0.004	-0.018	0.010
Feb-17	-0.018	-1.610	0.036	0.006	-0.004	-0.018	0.016
Jan-17	0.029	0.637	0.064	0.038	0.042	0.006	0.055
Dec-16	0.018	1.243	0.041	-0.002	0.043	0.015	0.000
Nov-16	0.008	0.462	0.051	-0.012	0.009	0.020	-0.003
Oct-16	0.005	-4.202	0.003	-0.014	0.039	-0.001	-0.009
Sep-16	-0.002	-1.030	-0.046	-0.023	-0.019	-0.028	-0.063
Aug-16	0.057	0.915	0.053	0.025	0.023	0.035	0.037
Jul-16	0.030	-0.134	0.013	0.032	0.035	0.034	0.066
Jun-16	0.035	-0.113	0.008	0.017	0.029	0.018	0.027
May-16	0.039	-0.378	0.046	0.002	0.023	0.002	-0.024
Apr-16	0.063	0.010	0.047	0.037	0.035	0.030	-0.053
Mar-16	0.062	0.991	0.074	0.043	0.122	0.058	0.100
Feb-16	0.031	-2.478	0.053	0.000	0.077	0.020	0.057
Jan-16	-0.021	-0.519	-0.036	-0.018	-0.053	0.014	-0.116
Dec-15	-0.044	-7.887	-0.080	-0.050	-0.102	-0.013	-0.152
Nov-15	0.006	-0.760	-0.018	-0.004	0.005	0.009	-0.048
Oct-15	0.027	-0.164	0.029	0.021	0.037	-0.016	-0.005
Sep-15	0.032	-1.469	-0.013	0.001	-0.052	0.014	-0.001
Aug-15	-0.068	-0.727	-0.084	-0.029	-0.099	-0.022	-0.043
Jul-15	-0.248	6.336	-0.034	0.123	-0.018	0.139	0.082
Jun-15	-0.034	-2.841	-0.002	-0.005	0.001	-0.006	0.002
May-15	0.018	-0.944	0.000	0.001	0.000	0.002	-0.002
Apr-15	0.330	-7.333	0.100	-0.115	0.000	-0.104	-0.088
Mar-15	-0.052	-9.038	-0.048	-0.024	-0.039	-0.039	-0.025
Feb-15	0.006	-1.011	0.067	0.064	0.065	0.028	0.017
Apr-14	0.004	-0.930	0.007	0.033	0.040	0.027	0.059
Mar-14	0.054	75.114	0.021	0.051	0.038	0.061	0.053
Feb-14	0.001	-1.040	0.006	0.038	0.009	0.038	0.031
Jan-14	-0.018	-1.505	-0.056	-0.053	-0.057	-0.069	-0.043
Dec-13	0.035	-9.716	-0.009	-0.055	-0.014	-0.036	-0.051
Nov-13	-0.004	-1.103	-0.009	-0.044	-0.029	-0.022	-0.085
Oct-13	0.039	-3.845	0.056	0.055	-0.001	0.061	0.030
Sep-13	-0.014	-0.780	0.045	0.003	0.032	0.000	0.000
Aug-13	-0.063	28.479	-0.039	-0.031	-0.026	-0.044	-0.043
Jul-13	-0.002	-0.979	0.005	-0.042	0.020	-0.031	0.052
Jun-13	-0.104	-0.979	-0.108	-0.129	-0.053	-0.094	-0.084
Average	0.005	1.180	0.007	-0.001	0.004	0.003	-0.006

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