A STUDY OF THE PORTFOLIO PERFORMANCE CORRELATION BETWEEN SET AND NYSE

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Thematic Paper
entitled

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ABSTRACT

This research aims to examine the possibility of international diversification benefits by using the Fama and French Three Factors Model in addition to two risk measurements between two stock exchange markets – Stock Exchange of Thailand (SET) and New York Stock Exchange (NYSE) – from December 2001 to October 2010. According to the Fama and French Three Factors Model, the excess market return and size are found to be significant in both markets. Afterwards, a low negative correlation of the Sharpe (Treynor) ratio between the two markets indicates the possibility of international diversification benefits. This is confirmed by a weak significance of the Sharpe (Treynor) ratio from NYSE. The performance of SET can be explained by two control variables, which are exchange rate and export instead. Therefore, international diversification benefits exist as the two stock exchange markets have different characteristics and negative correlation.

KEY WORDS: PORTFOLIO / FAMA AND FRENCH THREE FACTOR MODEL/ INTERNATIONAL DIVERSIFICATION

38 pages

กรณีศึกษาความสัมพันธ์ของสมรรถภาพการลงทุนในตลาดหุ้นระหว่าง SET และ NYSE
A STUDY OF THE PORTFOLIO PERFORMANCE CORRELATION BETWEEN SET AND NYSE

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บทคัดย่อ

งานวิจัยชิ้นนี้จัดทำขึ้นเพื่อศึกษาความเป็นไปได้ของผลประโยชน์จากการกระจายความเสี่ยงสู่การลงทุนในต่างประเทศ โดยใช้กรณีศึกษาตลาดหุ้นระหว่างตลาดหุ้นไทย (SET) และตลาดหุ้นนิวยอร์ค (NYSE) ตั้งแต่เดือนธันวาคม 2544 ถึงเดือนตุลาคม 2553 มีการนำทฤษฎี Fama and French Three factor Model มาใช้ในการคำนวณควบคู่กับการวัดความเสี่ยง ผลลัพธ์ที่ได้จาก Fama and French Three factor Model แสดงให้เห็นว่าตัวแปรจากผลตอบแทนส่วนเกินของตลาดและขนาดของบริษัทมีความสัมพันธ์กับผลตอบแทนส่วนเกินของหลักทรัพย์การลงทุน อีกทั้งยังพบความสัมพันธ์ในทิศทางตรงข้ามของสองตลาดแม้จะอยู่ในเกณฑ์ต่ำจากการวัดความเสี่ยงตามแบบ Sharpe และ Treynor ratios นอกจากนี้ตัวแปรของ Sharpe และ Treynor ratios จากตลาดหุ้นนิวยอร์ค ยังมีความสัมพันธ์อยู่ในเกณฑ์ต่ำกับตลาดหุ้นไทย เนื่องจากตลาดหุ้นไทยมีตัวแปรควบคุมอื่น อันได้แก่ อัตราแลกเปลี่ยน และมูลค่าการส่งออก เป็นตัวคาดการณ์แทน ดังนั้นผลวิจัยนี้ได้แสดงให้เห็นว่าผลประโยชน์จากการกระจายความเสี่ยงในแง่ของการลงทุนในตลาดต่างประเทศยังคงมีความเป็นไปได้ เนื่องจากตลาดหลักทรัพย์ทั้งสองแห่งมีลักษณะแตกต่างและเคลื่อนไหวในทิศทางตรงข้ามกัน

38 หน้า

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CHAPTER I
GENERALITIES OF THE STUDY

1.1 Introduction of the Study

There are a lot of studies on the topic of stock investments recommending that investors should hold a well-diversified portfolio in order to reduce its risk. Numerous researchers have taken that concept further by recommending that investors form a well-diversified international portfolio for reducing financial risk, especially in terms of firm-specific risk. In one early study, Levy and Sarnat (1970) constructed an optimal international portfolio that was able to reduce risk by including stocks from other countries instead of holding only U.S. stocks. Meanwhile, Fletcher and Marshall (2005) believed there was a trend in financial markets over the past 20 years revealing increased opportunities for international investment due to financial deregulation around the world. They also proved that the international diversification benefited U.K. investors from a significant increase in the Sharpe ratio and certainty equivalent return (CER) performance. Likewise, Lagoarde-Segot and Lucey (2007) highlighted in their study that the presence of diversification benefits in the area of the Middle East and North Africa (MENA) region could attract flow into the portfolio. Flavin and Panopoulou (2009) supported the international diversification by stating that it was more effective for risk adjustment than domestic investment. They also showed a strong support in their study for the international diversification benefits across periods of high volatility.

Based on the above-mentioned research, we initiatively believe an investor can benefit from portfolio diversification by moving from a domestic to an international strategy. We can see most of the researches were conducted in the western perspective with few researchers aiming to study in Asia countries. Therefore, the purpose of this research is to gain more insight of understanding portfolio performance in the Thai market compared to the United States as an international

market. We firstly attempt to examine the possibility of international portfolio diversification benefits for Thai investors when moving to an international strategy. We apply an index of the top 50 stocks from the Stock Exchange of Thailand (SET50) and top 100 stocks from Standard and Poor (S&P100) in our model as optimal portfolio indices.

The paper is organized as follows: Chapter 2 details a review of literature relating to the topic of international portfolio diversification, correlation, the Fama and French Three Factors Model, and control variables used in the model. In chapters 3 and 4, the framework and methodology to be used in this study are presented. Chapter 5 shows the results from the models, and conclusion is presented in chapter 6.

1.2 Research Objectives

Two main research objectives are conducted in this paper. Firstly, we investigate and compare the characteristics of two stock exchange markets –Thailand and the United States – by using the Fama and French Three Factors Model. From this model, a significant regression coefficient (beta) from excess return will be applied in the next calculation. Afterwards, we will examine the possibility of international diversification benefits. A pre-test is then conducted by applying two risk measurement methods, which are the Sharpe and Treynor ratios, to examine the portfolio performance of the Thai market and determine whether it correlates with the international market or not. Finally, we continually run a multiple regression between risk measurement of the Thai and international market by adding five control variables in the model. The presence of international diversification benefits will be investigated based on the results of the regressions.

1.3 Statement of the Problem

Based on the two objectives above, we examine two main research questions as follow:

1.3.1 Does the Fama and French Three Factors Model explain the domestic and international market with a significant beta of excess market return?

1.3.2 Do Thai investors benefit from moving their domestic portfolios into international portfolios?

1.4 Limitations of the Research

This paper is conducted from the perspective of Thai investors towards the diversification benefits of an international portfolio. We apply secondary data from DataStream International, Bloomberg, and Bureau of Trade and Economic indices in our model. Instead of constructing the portfolios, we apply a price index from SET50 and S&P100 to be used as optimal domestic and international portfolio indices.

1.5 Significance of the Study

The aim of this paper is to gain more insight of understanding the market characteristics and the portfolio performance compared between two stock exchange markets: Stock exchange of Thailand (SET) and New York Stock Exchange (NYSE).

Firstly, we would like to test whether the Fama and French Three Factors Model explains both markets well or not. We apply an index from SET50 to be used as an optimal portfolio index for the domestic market. Similarly, S&P100 is used for the international market. From this testing, a significant beta from excess return in this model can be applied in the second step.

Secondly, we would like to conduct a pre-test to measure whether there is any benefit for Thai investors when they invest in foreign stocks or not. Consequently, we examine the correlation between two portfolios by using two different risk measurements, which are the Sharpe and Treynor ratios. If the performance of SET50 correlates highly with S&P100, there is not much benefit when moving to an international strategy. The benefit from international diversification will occur when the two optimal portfolios are not perfectly correlated.

Finally, international diversification benefits are confirmed by multiple regressions. We run regressions between the Sharpe (Treynor) ratio from SET against NYSE by having the ratio from the Thai market as a dependent variable and the ratio from the NYSE as an independent variable. Moreover, we add oil price, exchange rate, inflation, export and employment from the Thai market as control variables in the model.

The aim of this study is to benefit Thai investors when making a decision about an international investment strategy as it shows the performance of two portfolios under two different risk measurements. We therefore are able to identify the characteristics of the two markets and examine how two optimal portfolios associate with each other.

CHAPTER II
REVIEW OF RELATED LITERATURE AND STUDIES

In order to compare the performance of the two portfolios, this chapter mainly reviews literature related to international portfolio diversification, correlation, the Fama and French Three Factors Model, and control variables that are applied in the multiple regression model.

2.1 Theories and Studies of International portfolio diversification

Previous researches showed that there were significant benefits in international portfolio diversification. For instance, Fletcher and Marshall (2005) studied the benefits of moving from a domestic portfolio to an international portfolio by using three viewpoints: global industry, country equity, and investment sector of unit trusts. They examined the posterior distributions of DSharpe and CER performance using data from January 1985 to December 2000. This study showed that there were significant benefits from adding international assets to the portfolio based on a significant increase in the DSharpe and CER performance. Similar results were found in the study of Lagoarde-Segot and Lucey (2007), who investigated international portfolio diversification in the area of the MENA region. Data was collected from 1998 to 2006 in order to construct an international portfolio in dollars and local currencies for seven countries in the MENA region. The study revealed significant diversification benefits in MENA. There was also a studying on the robustness of international portfolio diversification benefits by Flavin and Panopoulou (2009). They investigated whether the benefits from international portfolio diversification remain robust over a boom and bust period of volatility in the markets or not. The study was conducted from the perspective of US investors who considered international investment in G-7 countries – Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States – from 1973 to 2005. They found that the

expected returns fluctuated during boom and bust periods, while the characteristics of expected returns were positive returns during boom periods and negative returns in bust periods.

From the Thai perspective, some researchers have broached the topic of international portfolio diversification. In studying the factors that affect foreign capital flow in SET, Chuanchai (1997) mentioned in his research that investing in an international portfolio was one alternative for risk diversification. One of his testing factors was the Dow Jones index. He found that this factor could affect foreign capital flow in and flow out in SET. Prommin (2000) studied the relationship between the daily returns of foreign securities and SET during 1984-1990. He found that return indices in SET had a negative relationship with the United States markets as a whole and did not have any relationship at all in some industries, while they had a positive relationship with Asian markets (South Korea, Malaysia, Hong Kong and Singapore). Another finding on international diversification benefits was discovered by Deetrakulwattanapol (2008). The study revealed a significant increase in the Sharpe ratio as there was not complete integration between the Thai and world markets. Therefore, Thai investors still gained benefits from international diversification.

2.2 Correlation

The correlation between stocks' return has long been tested by many researchers. They normally support the theory that the lower the correlation is, the higher the benefits from portfolio diversification appears to be. For instance, Levy and Sarnat (1970) showed in their paper that portfolio diversification could be evident when the correlations between stock returns were not perfectly correlated. According to their study, it revealed that Japan, which had a large share in the optimal international portfolio, owned negative covariance compared to other countries. Therefore, it could reduce the overall risk of the international portfolio. They also suggested the portfolio could be well diversified when the investor did not restrict to investing only in high income countries and included common stocks from countries that had negative correlation. Next, the study of Ragunathan and Mitchell (1997) was

conducted on the modeling time-varying correlation. They examined the correlation and covariance among stocks' returns and found evidence of time-varying correlation for Germany, Hong Kong, Norway and the world related to US index, while there were seven countries related to the world index. Another study related to the correlation among international stocks was conducted by Gupta and Mollik (2008). They examined the correlation between stock returns of Australia and emerging countries. To test the factors that caused change in correlation over time, a simple regression model was applied to estimate the factors by defining the correlation as dependent variable against the volatility of Australia, the volatility of emerging countries, and the volatility ratio of emerging countries to Australia as independent variables. They proved the correlation between stock returns of Australia and emerging countries were changed over time and the change was not uniform. The regression result showed there was a relationship between the volatility and the correlations. Brazil, Chile, India, Malaysia, and the Philippines had strong relationships while Sri Lanka and Turkey had weak relationships.

2.3 The Fama and French Three Factors Model

The Fama and French Three Factors Model is an alternative estimation different from the Capital Asset Pricing Model (CAPM) used to estimate expected return of stock. In this model, it applies three factors in its calculations, which are excess return, size and book-to-market ratio.

Fama and French (1992) found that the size, E/P, leverage and book-to-market ratio explained the cross-section of expected return for stock; however, some variables were redundant in the explanation. Therefore, they developed the CAPM by adding only two measured variables, which were size and book-to-market ratio. This model was able to provide better estimations for expected return of stock. Furthermore, Fama and French (1993) studied five common risk factors of stocks and bonds. There were three stock-market factors, which were the excess market return (Rm-Rf), factor related to firm's size (SMB), and book-to-market ratio (HML). These three factors together did a better job of explaining common variation in stock returns

than using one factor alone. In a recent study, Homsud, Wasunsakul, Phuangnark, and Joongpong (2009) applied the Fama and French Three Factors Model to study in the Stock Exchange of Thailand (SET) by dividing SET stocks into six portfolios. They found that this model captured risk better than CAPM in the estimation of stock return. According to this research, the Fama and French Three Factors Model provided 62.42% for average adjusted R square, while CAPM obtained only 29.47%. However, every factor in the Fama and French Three Factors Model did not have significance in all portfolios. By having three factors in the model, five out of six of portfolios were found to have significant size factor while the book-to-market ratio was significant for four out of six portfolios at a 95% confidence interval.

On the other hand, Bartholdy and Peare (2004) made a comparison between two models and found that the Fama and French Three Factors Model did not perform much better than CAPM. The results indicated that CAPM had 3% on average for adjusted R square while the 5% on average adjusted R square from the Fama and French Three Factors was not much higher than CAPM although size (SMB) was significant in the model.

2.4 Control Variables

2.4.1 Independent Variable – Inflation

Inflation has a negative effect on the future returns of stock prices, and investors' behavior on discount future returns. The decline in stock price occurs when uncertainty from inflation causes risk in investment, and a higher discount rate decreases future returns. In recent research, Apergis and Eleftheriou (2002) studied the relationship between inflation and interest rates toward stock prices in Greece. They found that stock prices followed the movement of inflation rather than interest rates. The decline in inflation in Greece was expected to result in higher stock prices.

2.4.2 Independent Variable – Exchange rate

Pan, Fok, and Liu (2007) examined the dynamic linkages between exchange rates and stock prices in East Asia. They found most of the countries in East

Asia had a causal relation between exchange rates and stock prices. Exchange rates have an effect on multinational companies; hence, they impact the returns and stock prices of the companies. A currency appreciation can reduce a company's profits by causing a decrease in the export of products. Conversely, an increase in the importing of products due to currency appreciation can generate higher profits for the company. Therefore, stock prices can be directly affected by currency appreciation (depreciation) because of the affect on company's profit. Adjasi, Harvey, and Agyapong (2008) also found that currency depreciation causes an increase of stock returns in the long run; however, stock returns drop in the short run.

2.4.3 Independent Variable – Oil Price

Papapetrou (2001) studied the relationship between oil prices and real stock returns in Greece. He found that the movements of oil prices affected economic activity in Greece and oil prices played an import role in the movement of stock returns. An oil price shock has a negative effect on stock returns as oil prices cause a decrease in a company's profits.

2.4.4 Independent Variable – Employment rate

In the same research of Papapetrou (2001), he also studied relationships between stock returns and employment in Greece. The results showed that stock returns reacted negatively to employment, as an increase in employment leads to more input materials in the production process. Therefore, it affects the decline of a company's profits.

2.4.5 Independent Variable – Export

Export has a direct relationship with exchange rates as depreciation on currency increases the demand of exports in a country; therefore, export also has an effect to stock returns. Adjasi, Harvey, and Agyapong (2008) conducted a research on the effect of macroeconomics on the Ghana stock exchange and one of their macroeconomic variables was trade deficit. They found that trade deficit has a negative effect on stock returns.

CHAPTER III
RESEARCH FRAMEWORK

3.1 Theoretical Framework

Fama and French (1993) determined the three factors that can affect the excess return of a portfolio. Two additional factors apart from the CAPM model were used to overcome the complexity of the markets. Thus, we apply the theory of the Fama and French Three Factors Model in our own framework in order to get more accurate regression coefficients (beta) from the model. In this model, the excess return for optimal portfolio is regressed against the excess market return, SMB and HML. We would like to find out the significant relationship between variables. If the regression coefficients (beta) are different from zero, there are relationships between the excess return and the three factors. We then apply the regression coefficient of the excess market return into our next step to calculate the Treynor ratio.

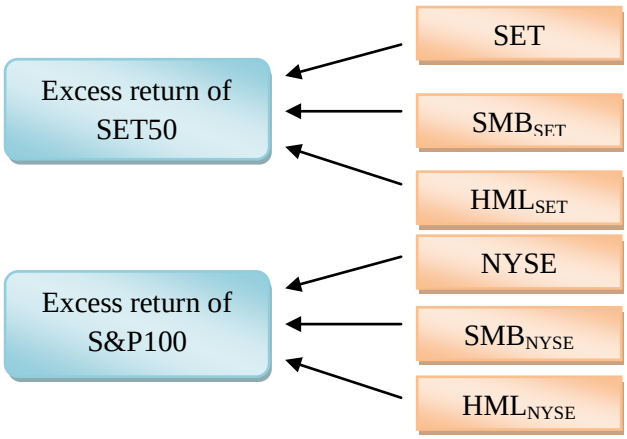
We adopt the framework for studying the performance of the portfolio based on two difference risk measurements, which are the Sharpe and Treynor ratios. The Treynor ratio was introduced as a technique to calculate both the risk and the return of portfolio performance. It involves the excess of a portfolio's return and the beta of the excess market return, which can be obtained from the above model in order to measure the systematic risk in the portfolios. As the beta of the excess market return is applied to be a risk measurement in this calculation, the Treynor ratio incorporates only systematic or market risk. This risk affects most firms in the market and it cannot be eliminated. Meantime, the Sharpe ratio was developed as an alternative to measure the portfolio performance in another aspect of risk. This ratio involves the excess of a portfolio's return and the standard deviation of the portfolio's return by observing both systematic and unsystematic risk. The main advantage of the Sharpe ratio lies in a direct computation from any observed time series data while the Treynor ratio needs

more calculations from regression. Our framework applies both theories to make a comparison of portfolio performance. Afterwards, a pre-test is conducted on the correlation between two markets by using the Sharpe and Treynor ratios. The higher the correlation between the two markets, the fewer international diversification benefits there are for Thai investors.

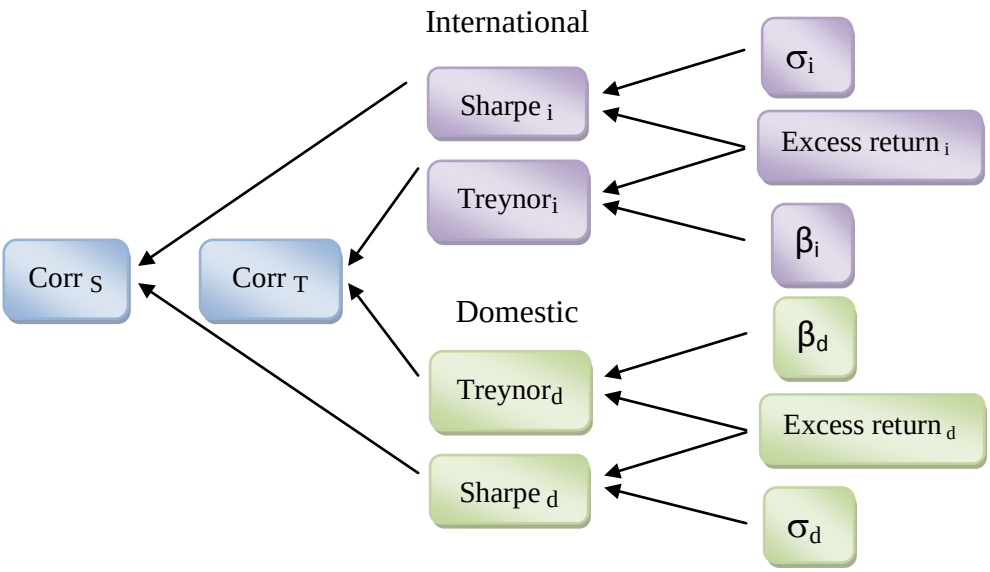
Finally, we confirm the possibility of international diversification benefits by running a multiple regression of the two markets. The Sharpe (Treynor) ratio from SET is applied as a dependent variable while the independent variables are the Sharpe (Treynor) ratio from NYSE and five control variables, which are oil price, exchange rate, inflation, export and employment from the Thai market.

3.2 Conceptual Framework

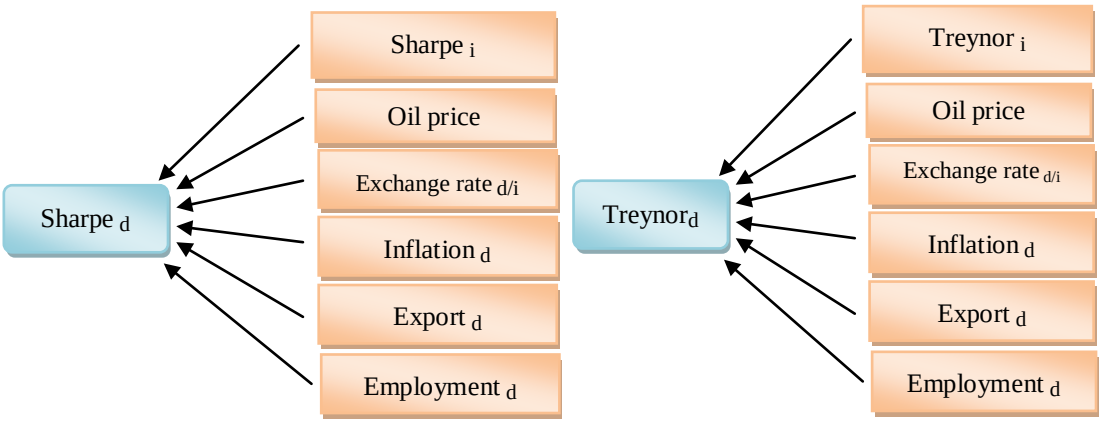
Based upon the above theoretical framework, we have proposed the excess return of SET50 index and the excess return of S&P100 to be dependent variables whereas SMB, HML, and the market return from SET and NYSE are to be independent variables. The frameworks are illustrated below.



Afterwards, a significant beta of excess market return is applied in the next framework to compute the Treynor ratio for both optimal portfolios. The Sharpe ratio is also directly calculated from a time series of monthly returns in order to run the correlation between the two portfolios. These correlations can reveal the presence of benefits from international diversification along the guidelines of the lower the correlation, the higher the benefit from portfolio diversification appears to be.



From the framework above, we then apply a time series of the Sharpe and Treynor ratios from the Thai market to be dependent variables while one of the independent variables is a time series of the Sharpe and Treynor ratios from the international market. Furthermore, we add oil price, exchange rate, inflation, export and employment from the Thai market as control variables in the model as below.



3.3 Research Hypotheses

3.3.1 The Fama and French Three Factors Model

These hypotheses are from the Fama and French Three Factors Model in order to test relationships between the dependent and independent variables. We run the regression and test the significance of the betas.

H1: The regression coefficients (beta) from SET are significantly different from zero.

H2: The regression coefficients (beta) from NYSE are significantly different from zero.

3.3.2 Correlation between the ratios of two optimal portfolios

We then test the correlation between two optimal portfolios from the Sharpe and Treynor ratios.

H3: The correlation of the Shapre ratio between SET and NYSE is perfectly correlated.

H4: The correlation of the Treynor ratio between SET and NYSE is perfectly correlated.

3.3.3 Multiple Linear Regression

Multiple linear regression is also applied to examine the significant beta of two risk measurements between the two markets.

H5: The regression coefficient (beta) of the Sharpe ratio from NYSE is significantly different from zero.

H6: The regression coefficient (beta) of the Treynor ratio from NYSE is significantly different from zero.

3.4 Operationalization of the Independent and Dependent Variables

Variables	Definition
Excess expected returns	- Defined as dependent variables. - Applied from the price index of SET50 for a portfolio in the domestic market and the price index of S&P100 for a portfolio in

	the international market. - Calculated by the expected return minus risk free rate.
Excess market returns	- Defined as independent variables. - Applied from the price index of the Stock Exchange of Thailand (SET) for the domestic market and the New York Stock Exchange (NYSE) for the international market. - Calculated by the expected market return minus risk free rate.
SMB	- Defined as independent variables. - It is the difference between the return on a portfolio of small stocks and big stocks. (Fama and Franch, 1992) - Calculated from the average price indices of the top five biggest and five smallest companies ranked by market capitalization in SET and NYSE.
HML	- Defined as independent variables. - It is the difference between the returns on a portfolio of high book-to-market equity stocks and low book-to-market equity. (Fama and Franch, 1992) - Calculated from the average price indices of the top five highest and five lowest companies ranked by book-to-market ratio in SET and NYSE.
Sharpe ratio	- A technique to measure portfolio performance by using both risk and return. - This ratio involves excess return and beta of the market return over a testing period.
Treynor ratio	- An alternative to measure portfolio performance in another aspect of risk measurement. - This ratio involves excess return and standard deviation of a portfolio's return.
Oil price	- Defined as a control variable. - Has a negative effect on stock returns as oil price causes a decreasing of a company's profits. (Papapetrou, 2001)

Exchange rate	- Defined as a control variable. - Stock price is directly affected by currency appreciation (depreciation)**. (**Pan, Fok, and Liu, 2006)
Inflation	- Defines as a control variable. - Has a negative effect on stock price**. (**Apergis and Eleftheriou, 2001)
Export	- Defined as a control variable. - Has a direct effect with exchange rate.
Employment	- Defined as a control variable. - Has a negative effect on stock price**. (**Papapetrou, 2001)

CHAPTER IV
RESEARCH METHODOLOGY

4.1 Econometric Model

The purpose of this study is to find out the presence of international portfolio diversification benefits from the perspective of Thai investors. We adopt the concept of the Fama and French Three Factors Model in this paper to capture the regression coefficients (beta) of excess market return. This model allows us to compare the optimal portfolio performance with the market as a whole by adding two more factors, which are size (market capitalization) and book-to-market ratio, apart from the excess market return in the model.

We use the following regression model to estimate the excess return in each market. The regression models are written as:

$$R_{SET50} - R_{f\text{-}TH} = \beta_{0d} + \beta_{1d} * (R_{SET} - R_{f\text{-}TH}) + \beta_{2d} * SMB_{SET} + \beta_{3d} * HML_{SET} \quad (1a)$$

$$R_{S\&P100} - R_{f\text{-}US} = \beta_{0i} + \beta_{1i} * (R_{NYSE} - R_{f\text{-}US}) + \beta_{2i} * SMB_{NYSE} + \beta_{3i} * HML_{NYSE} \quad (1b)$$

Where, R_{SET} represents the percentage change in monthly return from the domestic market and R_{NYSE} represents the percentage change in monthly return which is considered as the international market during the testing period. $R_{f\text{-}TH}$ and $R_{f\text{-}US}$ are the percentage change in return from a one month risk-free rate in the domestic and international markets, respectively. SMB_{SET} and SMB_{NYSE} stand for "small market capitalization minus big market capitalization" in SET and NYSE, respectively. Similarly, HML_{SET} and HML_{NYSE} are defined as "high book-to-market ratio minus low book-to-market ratio" in SET and NYSE, respectively. All three factors are defined as independent variables in the regression. β_1 which we get from the regression represents the regression coefficient (beta) of the excess market return or we can define as systematic risk. β_2 and β_3 are regression coefficients (beta) from SMB and HML factors which represent the characteristics of the market. The meaning of the regression coefficient β_1 is used to measure the change per unit in terms of excess

market return, holding other factors constant. Likewise, β_2 and β_3 measure the change per unit in terms of size and book-to-market ratio. Next, we apply a monthly return index from SET50 and S&P100 to be the optimal portfolio indices for the domestic and international markets, respectively. Therefore, $R_{SET50} - R_{f\text{-}TH}$ is a dependent variable of percentage change in the excess monthly return for the domestic portfolio while $R_{S\&P100} - R_{f\text{-}US}$ is a dependent variable of the percentage change in the excess monthly return for the international portfolio.

We then apply the measurement of portfolio performance by using the Treynor ratio in this study in order to examine systematic risk in the portfolio. The Treynor ratios are calculated from a significant β_1 that we get from the equation (1a) and (1b).

$$T_d = [\ R_{SET50} - R_{f\text{-}TH}\ ]\ /\ \beta_{1d} \qquad (2a)$$

$$T_i = [\ R_{S\&P100} - R_{f\text{-}US}\ ]\ /\ \beta_{1i} \qquad (2b)$$

Where, β_1 is the beta from excess market return that we get from the Fama and French Three Factors Model.

Afterwards, the Sharpe ratio is directly calculated from the standard deviation of percentage change in the optimal portfolio's return. Following the Sharpe ratio, this measurement incorporates both systematic and unsystematic risk in the portfolio. We compute the Sharpe ratio from the equations below:

$$S_d = [\ R_{SET50} - R_{f\text{-}TH}]/\ \sigma_{R_{SET50}} \qquad (2c)$$

$$S_i = [\ R_{S\&P100} - R_{f\text{-}US}\ ]\ /\ \sigma_{R_{S\&P100}} \qquad (2d)$$

Where, σ is the standard deviation of each optimal portfolio.

After having a time series of the Sharpe and Treynor ratios of the two markets, a pre-test on the presence of international diversification benefits is carried out by comparing the performance between the two optimal portfolios. We apply correlation as a measurement of the association.

$$Corr\ (T_i,T_d) = cov\ (T_i,T_d) / \sigma_{Ti}\ \sigma_{Td} \qquad (3a)$$

$$Corr\ (S_i,S_d) = cov\ (S_i,S_d) / \sigma_{Si}\ \sigma_{Sd} \qquad (3b)$$

Finally, multiple linear regression is applied to examine the presence of international diversification benefits by having the Sharpe (Treynor) ratio from SET as

a dependent variable against the Sharpe (Treynor) ratio from NYSE and five control variables as shown in the equations below.

$$S_d = \beta_0 + \beta_1 * S_i + \beta_2 * \text{Oil Price} + \beta_3 * \text{Exchange}_{d/i} + \beta_4 * \text{Inflation}_d + \beta_5 * \text{Export}_d + \beta_6 * \text{Employment}_d \quad (4a)$$

$$T_d = \beta_0 + \beta_1 * T_i + \beta_2 * \text{Oil Price} + \beta_3 * \text{Exchange}_{d/i} + \beta_4 * \text{Inflation}_d + \beta_5 * \text{Export}_d + \beta_6 * \text{Employment}_d \quad (4b)$$

Where, control variables are calculated in terms of percentage change. Oil price is the spot price of West Texas Intermediate. Exchange rate is Thai baht to US dollar and the other three control variables are indices of the Thai market.

4.2 Data

We evaluate the portfolio performance for the period December 2001 to October 2010 since one control variable has data available for that period. The data applied in the Fama and French Three Factors Model are comprised of monthly price index (PI) downloaded from DataStream International. All data in our study are downloaded in local currency. Firstly, SET and SET50 index represent the Thai market index and the optimal portfolio index for Thailand, respectively. Secondly, the NYSE index represents the United States or the international market index. The S&P100 index is applied as the optimal international portfolio index. We also apply the statistic data from DataStream International to calculate the SMB and HML factors. The monthly price index for the top 5 lowest and highest companies in SET and NYSE are applied for the SMB and HML calculations. Furthermore, we use a risk-free rate from Bloomberg for the US one-month Treasury bill, and the one-month government bond for the Thai market is downloaded from the Thai Bond Market Association in order to calculate the excess return in the model. For the five control variables, exchange rate and oil price are downloaded from Bloomberg while the other three variables are from the Bureau of Trade and Economic Indices.

4.3 Empirical Test

A method of the empirical test used in this study is presented as follows:

4.3.1 Excess return of SET50, S&P100, and excess market return of SET and NYSE

The Price Indies from DataStream International are downloaded in local currency. We then calculate the monthly return rate by defining the percentage change as shown below:

$$R_{i(t)} = (PI_t - PI_{t-1}) / PI_{t-1,}$$

Where:

PI_t is the monthly price index at month *t*.

$R_{i(t)}$ is the rate of return in month *t*.

Afterwards, we calculate the excess returns rate by applying a one month Treasury bill for the US market and a one month government bond for the Thai market as a risk-free rate.

4.3.2 SMB calculation

We apply the statistic data downloaded from DataStream International to calculate the SMB factor. Based on stocks listed in SET and NYSE, we rank companies by using market capitalization and select the top five smallest and biggest companies which have a price index available in the testing period. The SMB is calculated from the average return rate of the five smallest market capitalization companies minus the average return rate of the five biggest market capitalization companies.

4.3.3 HML calculation

Similarly to the SMB factor, we select the top five lowest and highest companies based on the book-to-market ratio (BE/ME) by applying total equity in the balance sheet as book value, and by applying market capitalization as market value. We then calculate the HML from the average return rate of the five highest book-to-market ratio companies minus the five lowest book-to-market ratio companies.

4.3.4 The Fama and French Three Factors Model

We apply a multiple regression analysis of the three variables model. The linear in the parameters is assumed in this model. We run a regression by having excess return from SET50 and S&P100 as dependent variables against the three factors, which are excess market return, SMB and HML as independent variables

According to the hypotheses, the regression coefficients, which are β_1, β_2, β_3, are tested at a 95% confidence interval to determine whether they are significantly different from zero or not.

4.3.5 The Sharpe and Treynor ratios

We next calculate the Sharpe and Treynor ratio by using a time series from the excess optimal portfolio return against the standard deviation of the portfolio's return and the regression coefficient (beta) of the excess market return, respectively. As there is a different measurement of risk used the calculations of the Sharpe and Treynor ratios, the two ratios measure different perspectives of risk. The Sharpe ratio consists of both systematic and unsystematic risk as we assume that the portfolio is still not well-diversified. Meanwhile, Treynor incorporates only on systematic risk by using the regression coefficient (beta) of excess market return as a denominator as we assume that the portfolio has already been diversified. Higher Sharpe and Treynor ratios indicate a better performance of the portfolios.

4.3.6 Correlation

A pre-test on the presence of international diversification benefits is conducted to test the third and fourth hypotheses. We test the correlation of the Sharpe and Treynor ratios between the two markets. The results from these hypotheses indicate an association between the two portfolios. When the two portfolios are highly correlated, it means that an international strategy may not be of benefit for Thai investors. Conversely, the possibility of benefits from international portfolio diversification may be present when the correlation between the two portfolios is not perfectly correlated.

4.3.7 Multiple Linear Regression between the two markets

Finally, we again run multiple linear regression to examine the presence of international diversification benefits by using the Sharpe (Treynor) ratio from SET as a dependent variable and the Sharpe (Treynor) ratio from NYSE as independent variable. Furthermore, five control variables, which are oil price, exchange rate, inflation, export and employment, are added in the model. If the t-stat of the Sharpe (Treynor) ratio from NYSE is significant, it may suggest no international diversification benefit as the stock exchange in Thai market goes along with the stock exchange in the international market.

CHAPTER V
RESULTS AND ANALYSIS

5.1 Descriptive Statistics

Table 5.1.1 shows a summary of the statistics of the monthly return rate for each price index. Based on the testing period from December 2001 to October 2010, the monthly return rate from SET50 (1.475%) performed better than the market (1.379%) but the standard deviation of SET50 (0.0747) was larger than the market (0.0686). On the other hand, the monthly return rate from S&P100 (0.018%) did not perform well when compared to the market (0.298%). The standard deviation of S&P100 (0.0457) was smaller than the market (0.0483).

Size (SMB) and book-to-market (HML) factors were calculated from the average monthly return rate of the top 5 smallest (lowest) and top 5 biggest (highest) listed companies in table 5.1.2. The top 5 smallest and biggest companies were selected based on market capitalization while the book-to-market ratio (total equity/market capitalization) was applied to select the top 5 lowest and highest BE/ME companies.

5.2 Testing Results from the Fama and French Three Factors Model

Table 5.2.1 provides a summary of the statistics for monthly return rates for the three factors in the model. The average monthly return rate for excess SET50 (Ri - Rf) and SET (Rm - Rf) were positive while the other two factors generated negative average returns. In contrast to the international portfolio, both average monthly return rates from the excess S&P100 (Ri - Rf) and NYSE (Rm - Rf) showed negative results. The HML factor also had a negative average return rate while only the SMB factor gave a positive average return rate in this market. Most of the standard deviations were less than 0.16, except the excess return from S&P100 and NYSE that

had high standard devotions (0.8951, 0.8928) due to large volatility on the US risk free rate during 2009.

Table 5.2.2 addresses the correlation coefficients of monthly return rates between the three factors in the model. For the Thai market, excess market return correlated negatively with SMB but correlated positively with HML. On the other hand, the excess market returns from the international market correlated positively with both SMB and HML. The correlation between SMB and HML had a positive relationship in both markets. The two correlation matrixes showed a low association between each variable.

Based on equation (1a) in the previous chapter, table 5.2.3 provides the regression results from the Fama and French Three Factors Model in the Thai market during December 2001 to October 2010 by having adjusted R square 99.31%. By considering t-stat at a 95% confidence interval, the results show that the t-stat of beta from the excess market return (111.5604) and SMB (-5.4614) were found to be significant and the p-values were very low (0.00, 0.00). Therefore, we reject the first hypothesis for these two factors and the regression coefficient (beta) of the excess market return will be applied in the next calculation. The results also show a positive relationship (1.0162) of beta between the excess market return and the excess return from SET50 while there was a negative relationship (-0.0635) between SMB and an excess return from SET50. Conversely, the first hypothesis is not rejected for beta of HML as there was no relationship between the excess return from SET50 and HML as a very high p-value (0.5315).

Table 5.2.4 presents an estimation from multiple regressions in equation (1b) for the international market during the same period. An adjusted R Square 99.98% is applied to estimate this equation. Similarly to the Thai market, t-stat of beta from excess market return (689.6459) and SMB (-5.0972) were found to be significant at a 95% confidence interval, and p-values were very low (0.00, 0.00). It shows a positive relationship between the excess return from S&P100 and the excess market return and negative relationship between the excess return from S&P100 and SMB. Therefore, the significant beta of the excess market return (1.0030) can be applied to calculate the Treynor ratio in the next part. In addition, we also do not reject the

hypothesis for the beta of HML in this equation as t-stat (1.4104) was not significant and had a high p-value (0.1615).

5.3 Testing Results from the Sharpe and Treynor ratios

Two hypotheses of correlation between the two ratios were tested and are shown in table 5.3.1. From a time series observation, the results show that the mean from both the Sharpe and Treynor ratios from SET (15.014% and 1.104%) were higher than NYSE (-277.069% and -12.63%) while the standard deviation of the two ratios from SET (1.8431 and 0.1355) was relatively lower than NYSE (19.5776 and 0.8924). Furthermore, the results from the Sharpe and Treynor ratios show that there were negative correlations (-0.20845, -0.20845) between the two pairs of optimal portfolios, therefore, the association between the ratios from SET and NYSE are not perfectly correlated.

5.4 Testing Results from multiple regressions between the two optimal portfolios

Table 5.4.1 presents a summary of the statistics for the monthly percentage change of control variables applied in the multiple regression model. During the testing period, Export had the largest average percentage change (2.189%) and highest standard deviation (0.21291) among the five variables. The lowest average percentage change was in the exchange rate which had a negative result (-0.362%) while inflation had lowest standard deviation (0.00999).

The correlation matrix among the independent variables, both from the Sharpe and Treynor ratios, is shown in table 5.4.2. All the control variables had low relations towards both the Sharpe and the Treynor ratios from NYSE. Inflation, export and employment rate each had negative correlations with the Shapre and Treynor ratios while oil price and exchange rate had positive correlations with the Shapre and Treynor ratios. The correlations among the control variables, except the correlation between employment and export (0.6434), show low association to each other.

As discussed in chapter 4, the estimation from multiple regression in equations (4a) and (4b) were tested and are shown in table 5.4.3. The two models from the Sharpe and Treynor ratios gave very similar results by having 10% of the adjusted R squares. T-stat (-1.9751) and p-value (0.0511) indicate a very weak significance of the Sharpe (Treynor) ratio from NYSE. However, the two control variables from the model, which are exchange rate and export, were found to be significant at a 95% confidence interval in the model by having t-stat -2.2738 and 2.007, respectively. Exchange rate showed a negative relationship toward the Sharpe (Treynor) ratio of SET by having a beta of -26.0304 for the Sharpe ratio's model and -1.9139 for the Treynor ratio's model. Conversely, export was found to have a positive relationship toward the Sharpe and Treynor ratios of SET by having betas of 2.1555 and 0.1585, respectively.

5.5 Summary

Table 5.5.1 addresses the important figures from the testing. The results from the Fama and French Three Factors Model in both markets show adjusted R squares of 99.31% for the Thai market and 99.98% for the international market. It can be concluded that this model is useful in estimating the excess returns of the optimal portfolios and the two factors in the model are well explained in both markets. The excess market return in both markets has a significant positive relationship with the excess returns from the optimal portfolio while the SMB has a significant negative relationship with the excess returns from the optimal portfolio. However, the HML in both markets is found to be insignificant. Based on the significance of the t-stat, the optimal portfolio is highly correlated with the market; therefore, the beta from the excess returns can be applied in the next calculation for the Treynor ratio.

Based on the above findings, a significant beta of the excess market returns (1.016) represents a higher systematic risk in the Thai market than in the international market (1.003) while the standard deviation of the optimal portfolio's return in the Thai market (0.0747) shows higher systematic and unsystematic risk than the optimal international portfolio's returns (0.0457). Furthermore, it is interesting to

see that when the two risk measurements are applied in the calculation, the outcome presents that the average performances from both the Sharpe (15.014%) and the Treynor (1.104%) ratios in the Thai market are much better than in the international market (-277.069% and -12.63%) and the correlation between the two markets is quite low (-0.20845). As the higher correlation between the two markets indicates a lesser degree of international diversification benefits, the low negative correlation between the Thai and international markets represents the possibility of benefits for Thai investor from moving to an international portfolio strategy.

Afterwards, the ratio from NYSE and the five control variables from the Thai market, which are oil price, exchange rate, inflation, export and employment, can explain the model around 10% according to the adjusted R square. However, the betas from the Sharpe and Treynor ratios of NYSE are found to have weak significance while the two factors of the control variables, which are exchange rate and export, are found to be significant; therefore, the Thai market has a special system which is mainly explained by these two control variables instead.

Table 5.1.1 Summary Statistics for monthly return rate of price index

Return Index	Mean	Standard deviation	Minimum	Maximum
Bangkok SET50	1.475%	0.0747	-30.791%	29.190%
Bangkok SET	1.379%	0.0686	-30.176%	19.522%
S&P100	0.018%	0.0457	-14.785%	10.792%
NYSE	0.298%	0.0483	-19.537%	10.733%

Table 5.1.2 Top five Companies in SET and NYSE

S.E.T	
Top 5 Smallest Companies	**Top 5 Biggest Companies**
YONG THAI PUBLIC CO	PTT EXPLORATION
THE BANGKOK NYLON	SIAM COMMERCIAL
ASIA FIBER PUBLIC CO	SIAM CEMENT PUBLIC
TONG HUA COMMUNICATION	ADV INFO SERVICE PCL
D.T.C. IND. PLC CO	BANGKOK BANK LIMITED
S.E.T	
Top 5 Lowest B/E Companies	**Top 5 Highest BE/ME Companies**
THAI-GERMAN PRODUCTS	ASIA FIBER PUBLIC CO
BEC WORLD	BANGKOK LAND PCL
SIAM COMMERCIAL	T.C.J. ASIA PUBLIC
DYNASTY CERAMIC	THAI AIRWAYS INT'L
COUNTRY GROUP	CASTLE PEAK HOLDINGS
NYSE	
Top 5 Smallest Companies	**Top 5 Biggest Companies**
CAPITAL TRUST, INC.	EXXON MOBIL CORP
FLOTEK INDUSTRIES	WAL-MART STORES INC
CAPITOL BANCORP LTD	JOHNSON & JOHNSON
CENTRAL PACIFIC FIN	PROCTER & GAMBLE CO
TORCH ENERGY ROYALTY	INT'L BUSINESS MACHS

Table 5.1.2 Top five Companies in SET and NYSE (continue)

NYSE	
Top 5 Lowest B/E Companies	**Top 5 Highest BE/ME Companies**
TALBOTS, INC.	CAPITAL TRUST, INC
UNISYS CORPORATION	AMERICAN INT'L GROUP
MAGNETEK INC	ISTAR FINANCIAL INC
ARVINMERITOR, INC.	FEDERAL AGRICULTURAL
GRACE, (W.R.) & CO	RAIT FINANCIAL TRUST

Table 5.2.1 Summary Statistics for monthly return rate of factors in The Fama and French Three Factors Model

Portfolio	Return Index	Mean	Standard deviation	Minimum	Maximum
Domestic	Ri - Rf	1.122%	0.1377	-33.215%	50.328%
	Rm - Rf	1.025%	0.1326	-32.092%	50.759%
	SMB	-0.854%	0.1063	-37.217%	32.149%
	HML	-0.866%	0.1430	-84.501%	36.530%
International	Ri - Rf	-12.668%	0.8951	-612.582%	84.199%
	Rm - Rf	-12.388%	0.8928	-610.177%	83.323%
	SMB	0.419%	0.1191	-31.350%	41.591%
	HML	-1.365%	0.1574	-42.026%	85.714%

Table 5.2.2 Correlation of monthly return between the three factors

Domestic	***Rm-Rf***	***SMB***	***HML***	***International***	***Rm-Rf***	***SMB***	***HML***
Rm-Rf	1			**Rm-Rf**	1		
SMB	-0.3478	1		**SMB**	0.0947	1	
HML	0.0044	0.2163	1	**HML**	0.0829	0.1445	1

Table 5.2.3 Regression of the Fama and French Three Factors Model (Thai market)

Observations	104		
Adjusted R Square	99.31%		
	Coefficients	**t Stat**	**P-value**
Intercept	0.0002	0.1902	0.8496
Rm-Rf	1.0162*	111.5604*	0.0000*
SMB	-0.0635*	-5.4614*	0.0000*
HML	-0.0051	-0.6279	0.5315

Table 5.2.4 Regression of the Fama and French Three Factors Model (International market)

Observations	104		
Adjusted R Square	99.98%		
	Coefficients	**t Stat**	**P-value**
Intercept	-0.0020	-1.5612	0.1216
Rm-Rf	1.0030*	689.6459*	0.0000*
SMB	-0.0560*	-5.0972*	0.0000*
HML	0.0117	1.4104	0.1615

Table 5.3.1 Summary Statistic and correlation of the Sharpe and Treynor ratios

Ratio	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
Sharpe SET	15.014%	1.8431	-444.545%	673.596%
Treynor SET	1.104%	0.1355	-32.686%	49.527%
Sharpe NYSE	-277.069%	19.5776	-13397.895%	1841.526%
Treynor NYSE	-12.630%	0.8924	-610.722%	83.943%
Sharpe SET&NYSE	-0.20845			
Treynor SET&NYSE	-0.20845			

Table 5.4.1 Summary Statistics for the control variables

Control Variable	Mean	Standard deviation	Minimum	Maximum
Oil Price	1.846%	0.09676	-32.621%	29.714%
Exchange	-0.362%	0.01561	-5.118%	3.489%
Inflation	0.060%	0.00999	-2.263%	2.559%
Export	2.189%	0.21291	-41.026%	71.554%
Employment	0.292%	0.06553	-19.680%	25.510%

Table 5.4.2 Correlation of monthly percentage change of the control variables

	Sharpe(Treynor)NYSE	***Oil Price***	***Exchange***	***Inflation***	***Export***	***Employment***
Sharpe(Treynor) NYSE	1					
Oil Price	0.0431	1				
Exchange	0.0770	-0.1639	1			
Inflation	-0.0838	0.3958	-0.1349	1		
Export	-0.0789	0.1671	0.1367	0.1472	1	
Employment	-0.1491	0.1575	0.0565	0.2490	0.6434	1

Table 5.4.3 Regression of the Shapre and Treynor ratios (by adding five factors as control variables)

	Observations	104		
	Adjusted R Square	10.00%		
	Coefficients (Sharpe)	**Coefficients (Treynor)**	**t Stat**	**P-value**
Intercept	-0.0377	-0.0028	-0.2084	0.8353
Sharpe (Treynor) NYSE	-0.0178*	-0.0286*	-1.9751*	0.0511*
Oil Price	-0.2292	-0.0169	-0.1155	0.9083
Exchange	-26.0304	-1.9139	-2.2738	0.0252
Inflation	31.5761	2.3217	1.6326	0.1058
Export	2.1555*	0.1585*	2.0070*	0.0475*
Employment	-5.9676*	-0.4388*	-1.6896*	0.0943*

Table 5.5.1 Summary

	Beta	Std. Deviation (Port Return)	Mean (Sharpe)	Mean (Treynor)	Correlation
SET	1.0162	0.0747	15.014%	1.104%	-0.20845
NYSE	1.0030	0.0457	-227.069%	-12.630%	

		Variables		
	Adjusted R-Square	***Rm-Rf***	***SMB***	***HML***
1a	99.31%	1.016 (111.56)*	-0.064 (-5.461)*	-0.005 (-0.628)
1b	99.98%	1.003 (689.646)*	-0.056 (-5.097)*	0.012 (1.41)

		Ratio (NYSE)	***Oil Price***	***Exchange***	***Inflation***	***Export***	***Employment***
4a	10.00%	-0.018 (-1.98)*	-0.229 (-0.116)	-26.03 (-2.274)*	31.576 (1.633)	2.155 (2.007)*	-5.968 (-1.69)
4b	10.00%	-0.029 (-1.98)*	-0.017 (-0.116)	-1.914 (-2.274)*	2.322 (1.633)	0.158 (2.007)*	-0.439 (-1.69)

CHAPTER VI
CONCLUSION

The purpose of this study was to examine the possibility of international portfolio diversification benefits by studying two optimal portfolios from the Stock Exchange of Thailand (SET) and the New York Stock Exchange (NYSE) during the period of December 2001 to October 2010. Two main objectives in this research have been examined in order to recognize whether the characteristics of both Thai and international markets are different or not. Based on the results, it could then be ascertained whether there is a possibility to diversify a portfolio's risk by moving from domestic to international investment. Additionally, the proposed models could be used to discover the similarities between the two markets and recognize the degree of those similarities.

The Fama and French Three Factors Model was applied in this study in order to capture the systematic risks for the Treynor ratio. Afterwards, two risk measurement methods examined the correlation between the two markets. Both the Sharpe and Treynor ratios were applied in this study because the Sharpe ratio could capture both systematic and unsystematic risks while only systematic risk was captured by the Treynor ratio. Moreover, we also ran multiple regression between the Sharpe (Treynor) ratio of the two markets to see the significantly different characteristics of the two markets. In addition, we added five control variables in the model: oil price, exchange rate, inflation, export and employment.

The outcomes of this research are as follow. Firstly, based on the findings of Fama and French (1993), the economic model applied in our testing consists of excess market returns, size (SMB), and book-to-market value (HML). Based on a very high adjusted R-square, this model indicated a good explanation. The excess market returns and size in both markets were found to be significant in this model with a positive relationship with the excess market returns and a negative relationship with size. Secondly, according to the two risk measurement methods, it shows that the Thai

market has better performance than the international market in terms of only unsystematic risk as well as both systematic and unsystematic risks due to a better performance on the Sharpe and Treynor ratios. It was also found that there is a negative and low correlation between the two markets indicating the possibility of international diversification benefits. Finally, the international diversification benefits are confirmed by a multiple regression of the Sharpe (Treynor) ratio between the two markets. The Sharpe (Treynor) ratio from NYSE has a relationship with the Sharpe (Treynor) ratio from SET; however, the relationship is negatively weak. The possibility of causing a negatively weak relationship may be explained by the fact that, first, the performance of the stock exchange in the international market, which is the United States, is worse than the performance of the stock exchange in Thailand during the testing period. Therefore, it leads to a weak relationship between each other. Next, there is a foreign capital flow into Thailand, which is considered a developing country, while there is a capital flow out from the United States, which is considered a developed country, causing negative relationship between two markets.

However, the Sharpe (Treynor) ratio from SET can be explained by the significant betas of the two control variables instead, which are exchange rate and export. The outcomes from the multiple regression show that export has a positive effect on the stock return, while exchange rate (baht to dollar) has a negative effect. As Thailand is an export-oriented country, it is reasonable that export has a strong impact on the performance of the Stock Exchange of Thailand. An increase in export demand generates significantly higher returns for the optimal portfolio in the Thai market. On the other hand, the negative effect of the exchange rate towards stock returns can be explained by the fact that although the Thai economy is export-oriented, the majority of capital flow in the stock exchange of Thailand is from foreign investment and the impact of foreign capital is stronger than companies' exports. Therefore, baht depreciation does not only support export-orientated companies, but it also impacts foreign capital flow out of the stock market leading to a decrease in stock returns in the short run. Moreover, when we see the correlations of the Sharpe (Treynor) ratio from NYSE against the exchange rate and exports, it is found to be a reverse sign and a very low association between the international market and these two control

variables. It, therefore, shows the different characteristics between the Stock Exchanges of Thailand and the United States.

From these results, we confirm that the international diversification benefit exists and Thai investors can diversify risk by setting the optimal portfolio into both Thailand and the United States as these two stock exchange markets have very different characteristics and the performances between the two stock exchange markets correlate negatively to each other.

In March 2008, The Bank of Thailand announced that Thai investors could invest in international stock markets. Therefore, the United States is one alternative for Thai investors to consider as a shift of strategy to international investment as buying international security is now less difficult than in the past. The investors could buy and sell securities online from other stock markets around the world. There are also brokers who help the investors to trade. However, when moving to an international strategy, the investors should consider several factors. Export and exchange rates could be one of the important factors for further study as they have a main impact on the Thai market; therefore, they might also impact international stock markets. Additionally, tax and regulations in those countries need to be understood as different countries have different styles of regulation. Further specific research on NYSE market is recommended because the investors need to have a better understanding on the environment of international stock markets before making a decision to invest.

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