EARNINGS YIELD-SHORT-TERM INTEREST RATE SPREAD AND FUTURE
MOVEMENT OF THE STOCK EXCHANGE OF THAILAND (SET)

By

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A Thesis Submitted in Partial Fulfillment
of the Requirements for the Degree of

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Graduate School of Business
Assumption University
Bangkok Thailand

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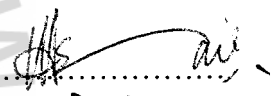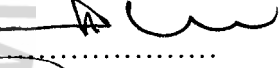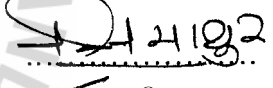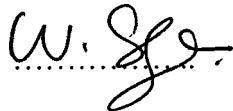
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ABSTRACT

Nowadays, the spreads between the stock market earnings yield and interest rates are wildly used to predict/explain the overall stock market outlook in U.S.. In the Thai stock market, an internationalized stock market, whether the spread has the ability to predict/explain the future stock market movement is still not clear.

The present paper investigated the relationship between the spread between the SET earnings yield and the three-month government bond interest rate and the future SET return to examine whether the spread could be used as a predictor of the future stock market movement in Thailand or not.

In this paper, monthly time series data of the spread and the SET return in the period from 1998 to 2002 were used to investigate the relationship in a linear regression model. And the T-test and Residual-test were employed to test the significance of the relationship also.

This paper found that there was a significant positive relationship between the one-month lag of the spread and the return on the SET index over the sample period. It means that the spread could be a predictor of the future SET return. And a higher spread leads to a higher SET return in the following month.

The investors and financial analysts could take advantage of the finding of this paper to know the direction of the futur stock prices using the rolling regression technique and the market model. Moreover, time points with the extreme values of the spread may be better time points to buy or se 1 stocks.

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Due to my limited ability, any deficiencies that remain in the paper are my own responsibility. And please forgive me.

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Chapter 1

Introduction

This chapter explains the background of the study and presents the statement of the problem. The objective and benefits of the study are discussed. The scope of the study is defined and the limitation of the study is explained also. Finally, the definitions of terms used in the study are offered in section 1.7.

1.1 Background of the Study

The Thai stock market, officially called the Stock Exchange of Thailand (SET), is an important mechanism to raise funds from the investing public. To a certain extent, it can be looked as the indicator of the Thai economy. Therefore, the government, corporations, and investors attach great importance to its performance and development.

Investors, who participate in the Thai stock market, hope to get higher return than getting from other markets such as the bond market or commercial bank deposits. In fact, it is very difficult but possible to do so. Facts indicate that the stock returns of all listed companies have specific relationships with the market portfolio return in a stock market. Normally, most listed companies' stock returns have positive relationships with the market portfolio return. They are measured by the beta coefficient (β). Thus, an accurate judgment of the overall market condition and

outlook can give a clear direction of future stock prices. Therefore, knowing the future movement of the Thai stock market, which can be measured by the future market return, is a crucial issue for the investors.

The issue of whether the spread between the stock market earnings yield and interest rate contains useful information about the future movement of stock market is a matter of empirical investigation in recent years (Rolph and Shen, 1999; Samanta and Bhattacharya, 2001). Earnings yield (E/P ratio) is simply the inverse of P/E ratio. It indicates how much investors can get when they invest 1 Baht in stocks for one period, assuming the company pays out all its earnings as dividends. The stock market earnings yield (market portfolio E/P ratio) is the average earnings yield of the whole stock market. As a comparison, interest rate represents the interest income per Baht invested in bonds or saved in commercial banks for one period. Earnings yields of individual stocks or portfolios are used to explain the stock or portfolio returns (Basu, 1977; Jaffe et al, 1989). In recent years, several papers using the stock market earnings yield or interest rates to forecast the overall market performance were published, for example, Campbell and Shiller, 1998; Lander et al, 1997; Pesaran and Timmermann, 1995; Rolph and Shen, 1999; and Samanta and Bhattacharya, 2001. Two of these papers, however, have used the spreads between the stock market earnings yield and interest rates as indicators for the overall market outlook. Rolph and Shen (1999) use the spreads between the earnings yield of the S&P 500 index' and the yields on bonds to predict the future market return in a

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' Rolph and Shen (1999) and Samanta and Bhattacharya (2001) selected the S&P 500 index and the BSE 100 index respectively as the sample index to represent the market portfolio index.

regression framework in U.S. stock market. In emerging Indian stock market, Samanta and Bhattacharya (2001) use the spreads between the BSE 100 index earnings yield and the short-term interest rates to explain the future market return using a regression model.

The issues related to the Stock Exchange of Thailand (SET)

The Stock Exchange of Thailand (SET) is the only one stock market in Thailand. Thus, all the issues related to the stock market in the study will be explored based on the SET. Here, four of the SET related issues will be discussed, which are (1) Historical development of the SET; (2) Return on the SET index; (3) Conditions of the SET earnings yield, three-month government bond interest rate and spread; (4) Performance and trend of the SET index in the period from 1998 to 2002.

(1) Historical development of the SET

The development of the Stock Exchange of Thailand can be clearly divided into two major phases. First, the Stock Exchange of Thailand was founded by a private group in July 1962. At that time, it was a limited partnership and known as the Bangkok Stock Exchange (BSE). One year later, it became a limited company

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² This material is taken from the official website of the SET.

with the name of "Bangkok Stock Exchange Co., Ltd." (BSE). Due to a lack of official government support and investors' poor understanding of the stock market, it had a very bad performance and development. In 1972, the turnover hit the unbelievable lowest level, 26 million baht only. The failure of the BSE to fulfill the role of the stock market in Thailand was realized by the government. In the second National Economic and Social Development Plan of Thailand (1967-1971), the need to establish an orderly and officially supported stock market, with appropriate facilities and procedures for securities trading, is clearly described. These shed lights on the second phase of the development of the Securities Exchange of Thailand. In April 1969, through the recommendation of The World Bank, the Thai government accepted the services of Professor Sidney M. Robbins from Columbia University, a former chief economist of the Securities and Exchange Commission in the United State. His report, "A Capital Market in Thailand", was used as the master plan to develop the Securities Exchange of Thailand. When the Securities Exchange of Thailand Act, BE 2517 (1974) was enacted on May 20, 1974, the BSE was forced to stop operations within several months. On April 30, 1975, the Securities Exchange of Thailand began trading. On January 1, 1991 "The Security Exchange of Thailand" formally changed its name to "The Stock Exchange of Thailand", which is still used right now. (www.set.or.th)

(2) Return on the SET index

There are three major indices, SET index, SET50 index, and Sectoral indices, in the SET. The market return of the study is the return of the market portfolio (SET), which can be computed based on the SET index, which is the market portfolio index. "The SET index is a composite index calculated based on common stock prices on the Main Board of the SET. It is a market capitalization weighted price index which compares the current market value of all listed common stocks with the value on the base date of April 30, 1975, which was when the SET Index was established and set at 100 points. Its calculation is adjusted in line with new listings, delistings, and capitalization changes." It is calculated through equation (1.1) below. Following Samanta and Bhattacharya (2001), equation (1.2) below is the formula to calculate the one-month SET index return at time point t, R_t, in the study.

$$\text{SET Index} = \frac{\text{Current Market Value}}{\text{Base Market Value}} \times 100 \quad (\text{www.set.or.th}) \qquad \textbf{(1.1)}$$

$$\text{SET Index Return} \quad R_t = \frac{(P_t -}{P_{t-1}} \quad \text{Where } P_t \text{ is the SET index at t point. } \textbf{(1.2)}$$

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[3] Market value (market capitalization) equals outstanding shares times stock price. (Brigham and Ehrhadt, 2002, p.49)

(3) Conditions of the SET earnings yield, three-month government bond interest rate and spread

The conditions of the SET earnings yield, three-month government bond interest rate and spread are discussed together (see figure 1.1). During the period from 1998 to 2002, the SET earnings yield had an average level of around 14%; the three-month government bond interest rate had an average level of around 4%; accordingly, the average spread was around 10%. It means that the Thai stock market is a profitable and attractive market. Therefore, more and more funds will flow in the Thai stock market and the stock prices should increase faster.

Figure 1.1 Monthly SET Earnings Yield, 3-Month Government Bond Interest Rate and Spread (from January 1998 to December 2002)
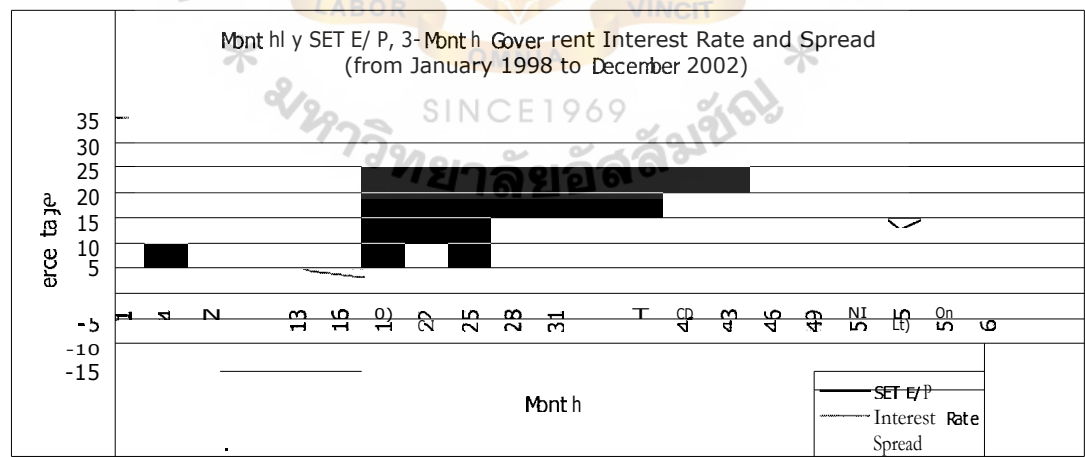
Source: Adapted from Census and Economic Information Center database

(4) Performance and trend of the SET index in the period from 1998 to 2002

In the study of the relationship between the spread between the stock market earnings yield and the short-term interest rate and the future short-term market return in the Thai stock market, the information about the performance and trend of the SET index is very important. Thus, it is shown in the figure 1.2 for the period from 1998 to 2002. As can be seen, the SET index had been fluctuating in a relatively narrow range and had a slight decrease trend during the period of five years.

Figure 1.2 Monthly SET Index (from December 1997 to December 2002)
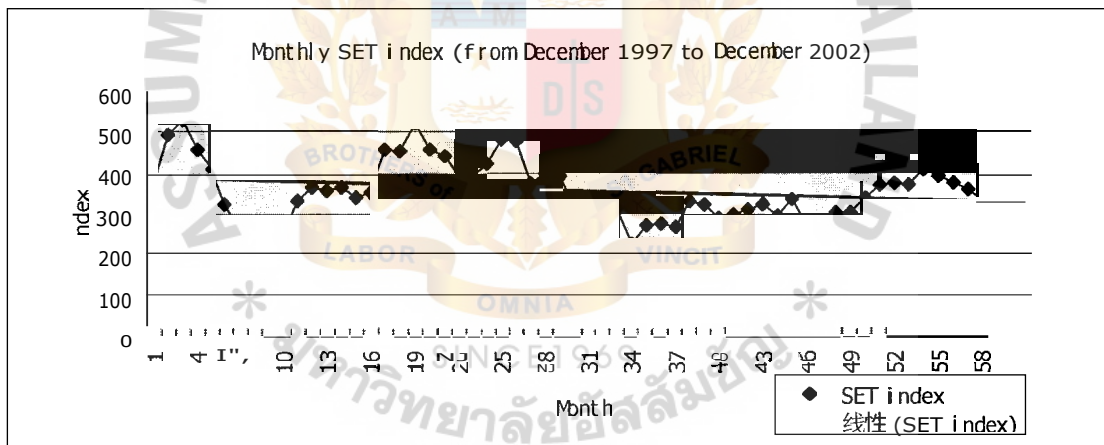
Source: Census and Economic Information Center database

1.2 Statement of the Problem

The market portfolio P/E ratio plays an important role in predicting future stock market movement. It indicates the average market price of one Baht of

earnings. In most studies, researchers look the P/E ratio and the E/P ratio as the same item. For the long-term stock market outlook, some historical evidences show that higher market portfolio P/E ratios are usually followed by poor stock market performance during the following decade in U.S. (Campbell and Shiller, 1998). For the short-term stock market outlook, especially, the one-month-ahead stock market outlook, researchers found that higher spreads between the stock market earnings yield and interest rates lead to a more favorable outlook for the overall stock market in U.S. and the short-term interest rates are more useful in this kind of study (Rolph and Shen, 1999). From investors' perspective, when they make a short-term investment decision, they consider the stock market earnings yield and interest rates together. The higher the spreads, the more willingness they have to invest their money in stocks. If the spreads between the stock market earnings yield and interest rates are relatively low, investors think that stocks are expensive relative to alternative investments. Then they may switch over from stocks to other assets to cause the stock prices either to fall or to decelerate. Similarly, the relatively high spreads may lead to faster growth in stock prices and hence higher return (Shen, 2000).

In reality, the stock market movement can be influenced by too many factors and the motives of the trading behaviors of the investors in the stock market are very complicated. Mainly based on the two explanations (Rolph and Shen, 1999; Shen, 2000) on why the spread may be useful in predicting the future market return and the specific situation in Thailand, the researcher raises three assumptions for conducting

the study. First, the form of efficiency of the Thai stock market is the Semistrong-form, which means that the current stock prices are influenced by all publicly available information. Second, most investors in Thailand are rational. Third, some investors in Thailand constantly change their assets locations between stocks and bonds (or other assets). When the spread is high, they invest their money in stocks; when the spread is low, they invest their money in bonds or other assets.

Around a decade ago, some investors (investment banks or individual investors) began to use the spreads between the stock market earnings yield and interest rates as indicators for the future short-term market movement in U.S. stock market. And some U.S. business publications (Wall Street Journal, Business Week) began to use the spreads to discuss the overall market conditions and outlooks as well (Rolph and Shen, 1999). In contrast, the spread between the stock market earnings yield and the short-term interest rate is still not widely used to predict/explain the future short-term stock market movement in Thailand. Fortunately, the SET has implemented a full disclosure policy, allowing investors to get accurate, adequate and timely information. As a result, investors can get the continuous monthly data of the SET P/E ratio and the SET index easily from some public mediums. But whether the spread is useful for predicting the future short-term movement of the Thai stock market is still a big question.

Therefore, the problem of the study is presented below:

Is there any relationship between the spread between the stock market earnings yield and the short-term interest rate and the future short-term market return

in the Thai stock market?

1.3 Research Objective

Rational investors select stocks to maximize their expected return, for a given level of risk. The total return to a shareholder (investor) has two components, dividend yield and share price appreciation. Holding the dividend yield constant, the total return to shareholders is directly related to the share price movement. Accordingly, any variable that would indicate the future direction of stock prices would be of interest to stock market investors. The findings of some previous studies, for example, Rolph and Shen (1999), suggest the spread between the stock market earnings yield and risk-free rate as a useful indicator of future stock market return.

The objective of the study is therefore to investigate whether there is any association between the spread between the stock market earnings yield and the short-term interest rate and the future short-term market return in the Thai stock market. In other words, it is to assess the usefulness of the spread in explaining the future short-term market return in the Thai stock market.

1.4 Scope of the Study

In the study, the researcher describes the scope from conceptual scope, geographic scope, and time frame, these three aspects.

Conceptual scope

The study will mainly focus on the relationship between the spread between the stock market earnings yield and the short-term interest rate and the future short-term market return in a stock market.

Geographic scope

The geographic area of the study will be limited on the Thai stock market-the Stock Exchange of Thailand (SET) only and the result will be applied in it only.

Time frame

The study will be based on the time series data of the SET index, the SET return, the three-month government bond interest rate, the SET P/E ratio and the SET E/P ratio in the period from January 1998 to December 2002. And all these data are monthly base.

There are two reasons to select this time period. First, Samanta and Bhattacharya (2001) used the latest 5-year time period, 1996-2000, because it is suitable for this kind of study. Second, the researcher aims to avoid the year of 1997, during which, all the twelve months spreads between the SET E/P ratios and the

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three-month government bond interest rates were negative values , which do not correspond with the theoretical explanation of Rolph and Shen (1999).

Moreover, the monthly data is used in the study because financial time series are volatile and therefore any attempt to predict the direction of stock market movement for an extended period of time is misplaced or futile and Rolph and Shen (1999) and Samanta and Bhattacharya (2001) used the monthly data for the same research purpose.

1.5 Limitation of the Study

The study is tentative to investigate the relationship between the spread between the stock market earnings yield and short-term interest rate and the future short-term market return in the Thai stock market. Thus, there are some limitations in the study.

The limitations for conducting the study are as follows:

(1) The study is conducted in the SET only.

(2) The limited time frame is drawn from January 1998 to December 2002.

(3) The interest rate used is the three-month government bond interest rate only.

(4) The spread and the market return are calculated monthly only.

(5) The market return includes the capital gains (or losses) only.

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⁴ The values of the spreads in 1997 are calculated based on the data from the CEIC database.

1.6 Significance of the Study

If there is any relationship between the spread between the stock market earnings yield and the short-term interest rate and the future market return in the Thai stock market, both the investors and financial analysts in Thailand will benefit from the study.

(1) Current and potential investors can use the finding of the study to predict the future market return or use the spread as one factor of a combination of many predictors of the future market return to predict the future market return. After that, they can have a relatively accurate estimation of the future returns of their own stocks through the analysis of the correlation between the market return and their own stock returns.

(2) Financial analysts can use the finding of the study to explain the overall market trend because it is a very important daily work for them. Moreover, they can also predict the specific stock or portfolio return based on the predicted market return and, thus, develop trading strategies.

(3) The extreme values of the spread could provide the investors or financial analysts better signals to buy or sell stocks or develop trading strategies.

1.7 Definition of Terms

In order to understand the terms in the study clearly, the researcher defines

some terms as follows:

Beta (0): It is the amount of risk that a stock contributes to the market portfolio. And it reflects the tendency of the stock's returns to respond to the market portfolio returns. (Brigham and Eharhardt, 2002, p. 221)

Capital market: They are markets for intermediate- or long-term debt and stocks. Here, "intermediate term" means one to five years, and "long term" means more than five years. (Brigham and Ehrhardt, 2002, p. 155)

Market portfolio: A portfolio including all stocks in a stock market is called market portfolio. (Brigham and Ehrhardt, 2002, p. 218)

Interest rate: It is the cost of borrowing money and measured in dollars per year per dollar borrowed. (Samuelson and Nordhaus, 1992, p. 500)

Risk: An asset's risk is the degree of uncertainty of its expected return. A high degree of uncertainty means high risk. (Francis, 1993, p. 14)

Stock return: It is the sum of cash dividend payments and capital gains (or losses), which equals the total change in invested wealth from the common stock investment during a given holding period. (Francis, 1993, p. 7)

Chapter 2

Literature Review

Before discussing the framework and methodology of testing of the relationship between the spread between the stock market earnings yield and the short-term interest rate and the future short-term market return, it is worthwhile examining the results/findings of the previous studies, which are relevant to the relationship between the spread between the stock market earnings yield and the short-term interest rate and the future short-term market return. These studies support the frameworks and methodology of this study also.

2.1 Literature to Support Framework

2.1.1 The Relationship between Key Concepts

The theoretical issues about the relationship between the spread between the stock market earnings yield and interest rate and the future market return were discussed by Rolph and Shen (1999) and Shen (2000). In a slight different context, the relationship between Gilt-Equity Yield Ratio and the stock price, Clare et al (1994) offered a reasonable explanation also.

Rolph and Shen (1999) provided an intuitive explanation on why the spread between the stock market earnings yield and interest rate may be useful in predicting the future stock market return. There are two relationships in the explanation. One is

the positive relationship between the growth rate of the market portfolio P/E ratio and the spread. The other is the positive relationship between the growth rate of the market portfolio P/E ratio and the future market return. Hence, the relationship between the spread and the future market return must be positive.

The authors' intuition is that, "relative to the interest rate, there is an equilibrium level of the spread, and when the spread is higher than its equilibrium level, the P/E ratio is more likely to grow faster, thus reducing the E/P ratio and the spread towards the equilibrium level, and vise versa." It means that the spread and the growth rate of the market portfolio P/E ratio are positively related.

Moreover, the authors used the equation below to calculate the expected future market return:

$$E_t R_{t+1} = E_t\, g_t^{p/e} + E_t\, g_t^{e} \qquad\qquad \textbf{(2.1)}$$

Where E_t was the expectation at time t; g_t was the growth rate from time t to t+1; R was the market return; e was the market portfolio average earnings; p was the market portfolio average stock price. This equation shows the positive relationship between the growth rate of the market portfolio P/E ratio and the expected market return.

Shen (2000) explained the reason why the spread is useful for predicting the future market return in an easy way. When predicting the short-term stock market returns, we should focus on the spreads between the stock market earnings yield and interest rates. There are two reasons. First, when the spread is relatively low, investors may think that stocks are expensive relative to alternative investments. In such situations, investors may switch from stocks to other assets to cause growth in

stock prices to slow. Similarly, a high spread may lead to faster growth in stock prices and hence higher return. Second, Lander et al (1997) and Rolph and Shen (1999) have found that in predicting monthly stock market returns, a combination of the stock market earnings yield and interest rates usually performs better than either the stock market earnings yield or interest rates alone.

Clare et al (1994) gave out a similar argument in a slightly different context. Investors usually choose an investment alternative between gilts and stocks. At that time, they care more about the relative value of bonds and equity as measured by the ratio of yield on gilts to the dividend yield, which is called the Gilt-Equity Yield Ratio (GEYR); and it has a long-run equilibrium level. If GEYR is relatively high, stocks are thought to be expensive relative to bonds. Under the condition of a given level of bond yield, stock yield must rise mainly through fall in stock prices. Similarly, if GEYR is relatively low, stock prices must rise.

Through these three explanations, especially, the first two of them, the theoretical positive relationship between the spread between the stock market earnings yield and interest rate and the future short-term market return could be understood clearly. And the spread is a better predictor of the future short-term market return, relative to stock market earnings yield or interest rate. It means that the relative average earnings yield of the whole stock market is a basic benchmark of investors to make a short-term investment choice between stocks and bonds (or other assets); and the spread might be a new and useful predictor of the future short-term market return.

2.1.2 Key Concepts

Market return is the return of the market portfolio, which includes all the stocks in a stock market. Both the capital gains (or losses) and the dividend yields are included in its content (Lander et al, 1997; Rolph and Shen, 1999). It represents the overall market performance and can give investors accurate and useful information to judge the overall market condition.

Earnings yield (E/P ratio) is a basic ratio to influence the return of investment on stocks. The earnings yield of a stock is equal to earnings per share divided by the price of a share of the stock (Shen, 2000). In most studies, the E/P ratio and the P/E ratio are considered as the same factor because of their simple inverse relationship. Some researchers suggested that the P/E ratio could be used as an indicator of future investment performance or future investment portfolio return (Basu 1977; Jaffe et al 1989). If the market portfolio is selected, the stock market earnings yield (market portfolio E/P ratio), in which E is the weighted average earnings per share of all the listed firms and the P is the weighted average share price of these firms, can explain the future market return. Briefly, low P/E securities or portfolios will tend to outperform high P/E securities or portfolios (Basu, 1977; Jaffe et al, 1989; Campbell and Shiller, 1998). If we consider it in an easy way, it means that investors pay relatively lower price on one Baht of earnings, and will get relatively higher return in the future.

Basu (1977) examined the relationship between portfolio P/E ratios and the investment performance based on the date in the period from 1956 to 1971 in NYSE market. In the sample with around 500 firms, five portfolios, A, B, C, D and E, were formed based on their ranks of P/E ratio. Portfolio A was the highest P/E quintile and portfolio E was the lowest P/E quintile. P/E ratio of every security could be calculated through equation (2.2) below. The author assumed that the P/E ratio portfolios would be purchased on the following April 1 because most firms release their financial reports within three months of fiscal year-end. After that, the monthly returns on each of these five portfolios were computed for the next twelve months based on the assumption of an equal initial investment in each of their respective securities and then keeping all these securities for a year. After the first year calculation, the above procedure would be repeated annually on each April 1 in the period from April 1957 to March 1971.

$$\text{P/E ratio} = \frac{\text{Total market value of common stock as of previous December 31}}{\text{Total reported previous annual earnings}} \qquad (2.2)$$

Based on the data of P/E ratios of these five portfolios and their returns, the author found that the two low P/E portfolios, D and E, earned on average 13.5% and 16.3% per year respectively over the period of 14-years; but the two high P/E portfolios, A and B, earned 9.3%-9.5% per year. Moreover, when one moved from the low P/E to high P/E portfolios, the average annual rates of return declined accordingly. It indicated that the P/E ratio and investment performance were

negatively correlated over the sample period.

The author also selected a standard of investment performance to compare with the actual return of each portfolio. The standard was based on the risk premium and calculated using equation (2.3), which was estimated by ordinary least squares (OLS) using 168 months of return data (April 1957-March 1971).

$$r_{pt} - r_{ft} = \delta_{pf} + \beta_{pf}(r_{mt} - r_{ft}) \qquad \textbf{(2.3)}$$

Where r_{pt} = return on P/E portfolio p in month t;

r_{mt} = return on market portfolio in month t;

r_{ft} = risk-free return in month t;

δ_{pf} = estimated intercepts;

β_{pt} = estimated slopes.

The result showed that the two low P/E portfolios, E and D, earned about 4.5% and 2% per year respectively more than that implied by their levels of risk, but the high P/E portfolios earned 2.5-3% per year less than that implied by their levels of risk. It indicated that return on company stocks or portfolio with relatively low P/E ratios was significantly higher than the return on company stocks or portfolio with relatively high P/E ratios over the sample period.

Jaffe et al (1989) examined the relationship between the earnings yield and the investment performance and the relationship between the market value and the investment performance with a relatively longer sample period, 1951-1986.

The portfolios were selected using two kinds of rank, earnings yield and market value. Based on the ratio of year-end earnings to share price at the end of

March in each year, those selected firms were ranked and placed into one of six groups, group 0, group 1, group 2, group 3, group 4, and group 5. All securities with negative earnings were put into group 0 and securities with positive earnings were put into group 1 to 5. Group 1 included the stocks with the lowest earnings yields, and group 5 contained the stocks with the highest earnings yields. Then the stocks in each earnings yield group were ranked on the March 31 market value of their common stock outstanding and five subgroups were formed according to their market values. Subgroup 1 included the stocks with the lowest market values and subgroup 5 contained the stocks with highest market values. As a result, totally, thirty subgroups or portfolios were formed. Moreover, each of those portfolios was updated annually.

After the calculation of equally weighted monthly returns for each of the thirty portfolios during the year, starting on April 1 and ending on the following March 31, they computed the average monthly returns of each portfolio during the period from March 31, 1951 to December 31, 1986. Then the average monthly returns, ranking market values, and ranking earnings yields for thirty portfolios were put in a summary table so that the relationship between the earnings yield and the investment performance and the relationship between the market value and the investment performance could be found easily and clearly.

As a result, the data in table 2.1 could provide strong evidence to prove that there were two relations among the investment performance, the ranking earnings yield and market value, these three items. One was positive relationship between the

ranking earnings yield and the investment performance except the negative earnings yield portfolio. The other was negative relationship between the ranking market value and the investment performance except the negative earnings yield portfolio.

Table 2.1 Part of the Results of Jaffe et al (1989)

April 1951 to December 1986

	Average Monthly Return				
	Earnings to Price Ratio				
Market value	Lowest	2	3	4	Highest
Smallest	1.62	1.36	1.52	1.68	1.90
2	1.14	1.15	1.13	1.42	1.62
3	1.12	0.99	1.09	1.44	1.52
4	1.02	1.01	1.10	1.43	1.47
Largest	0.89	0.90	0.97	1.24	1.43

Source: Jaffe et al, 1989

Campbell and Shiller (1998) examined the relationships between the long-term stock market outlook and the two market portfolio ratios, price-earnings (P/E) ratio and dividend-price (D/P) ratio. In the authors' opinion, both the P/E ratio and the D/P ratio will continue to fluctuate within their historical ranges in the future. When the P/E ratio is well below its long-term average, it tends to rise back to the average. And when the ratio is well above its long-term average, it tends to fall back to the average. Through two ways, the relatively high P/E ratio can fall back to its long-term average. First way is slower growth in stock prices; the second way is

faster growth in earnings. Similarly, faster growth in stock prices or slower growth in earnings can make the ratio rise back to the long-term average.

For each year in the period from 1880 to 1989, three measures were calculated. They are the S&P 500 index P/E ratio at the beginning of the year, the annualized changes in real stock prices over the following ten years, and the annualized changes in real earnings over the following ten years. If the relatively high P/E ratios move back to the average through changes in stock price growth, years with high P/E ratios should have low subsequent growth in stock prices. If the relatively high P/E ratios move back to the average through changes in earnings growth, years with high P/E ratios should have high subsequent growth in earnings. In their study, both simple graphs and correlation analysis were employed to identify the relationship between the P/E ratio and the growth rate of earnings and the relationship between the P/E ratio and the price growth rate.

Finally, the authors found that higher P/E ratios are usually followed by lower stock price growth during the following decade. In other words, the higher the earnings yield, the higher the stock price growth rate will appear in the future. But the systematic relationship between the P/E ratio and the earnings growth rate could not be found in their study. Similarly, the D/P ratio and the stock price growth rate are positive correlated. And the systematic relationship between the D/P ratio and the dividend growth rate could not be found either.

Interest rate is the price for borrowing money for a period of time. From

lenders' or investors' perspective, it is interest income per Baht invested in bonds or saved in commercial banks. It is the basic benchmark to choose investment alternatives. It is a useful predictor of future stock market movement (Pesaran and Timmermann, 1995; Lander et al, 1997).

Pesaran and Timmermann (1995) attempted to explain the stock market movement (as measured by the S&P 500 index) using several variables including both interest rate and earnings yield. The authors believe that stock returns could be predicted by means of publicly available information such as time series data on financial and macroeconomic variables.

Based on the public availability of statistical methods and computer technology mainly used by investors, the linear regression model was employed. In the basic model, the dependent variable was the market return; the independent variables included the past values of dividend yield, earnings yield, 1-month Treasury bill rate, 12-month Treasury bond rate and other six variables. The sample covered the time period from January 1954 to December 1992. And all the data were measured monthly. Finally, one of their findings showed that interest rate is very important and useful for predicting the future market return in U.S. stock market.

Lander et al (1997) combined the earnings yield and bond yield together to explain the future stock market (S&P 500 index) return. The authors believe that stock returns can be predicted and financial and accounting variables do have predictive power for stock returns. They also believe that many investors constantly make an investment choice between stocks and bonds; when the yield on bonds

increases, they will demand a correspondingly higher return on stocks; similarly, when the yield on bonds decreases, a lower return is demanded.

The authors assumed that there is equilibrium between forecasted earnings yields and yields on bonds; and the expected earnings yield on stocks and the yield on bonds should be closely linked. Based on this assumption, a simple linear equilibrium relationship between the equilibrium expected earnings yield, EP^*, and bond yield, R, was built and expressed by equation (2.4).

$$EP_t = a_0 + \rho R_t \qquad \textbf{(2.4)}$$

And then they denoted the deviation between the actual and equilibrium earning yields by e_t.

$$EP_t - EP_t = e_t \qquad \textbf{(2.5)}$$

When the disequilibrium exists, investors will change their assets allocation to cause stock prices to move in the direction that reduces the deviation. And the full adjustment cannot be completed immediately. Hence, equation (2.6) was formed.

$$SPRET_t = b_0 + ke_{t-1} + \varepsilon_t \qquad \textbf{(2.6)}$$

Where $SPRET_t$ was the stock return at t point, b_0 was the unconditional expected stock return, k was the speed of adjustment to the equilibrium expected earnings yield consistent with the bond yield, and ε_t was the unforecastable part of the period return. Finally, these three equations were combined into one below:

$$SPRET_t = a + k (EP_{t-1} - \rho R_{t-1}) + \varepsilon_t \qquad \textbf{(2.7)}$$

Where $a = b_0 - ka_0$. In their study, the monthly stock market return included two parts, the capital gain from holding stocks in the S&P 500 and the dividends paid on

those stocks; the average of realized earnings over the past year and forecast earnings over the coming year were used; and medium-term and long-term Treasury yields with maturities ranging from three to 30 years were used as the interest rate. All the data came from the period from 1979 to 1996.

Through a regression analysis, the authors got two main findings. First, the almost equal changes in the earnings yield and interest rate could not systematically influence stock returns during the following month. Second, when the earnings yield relative to the interest rate decreased, the stock return tended to become less in the following month; similarly, when the earnings yield relative to the interest rate increased, the stock return tended to become more in the following month. If these two findings are considered together, it means that the spread between the earnings yield and interest rate is a simple and good predictor of the short-term market performance.

Spread between earnings yield and interest rate is the difference between earnings yield and interest rate. It is a benchmark of investors to choose investment alternatives. From accounting perspective, it is the part of return that investors get from the companies in the stock market more than what they get from bond issuers or commercial banks in one period. It is one reason why investors invest their money in stock market. In real practice, the past information of the spread between the stock market earnings yield and interest rate could be useful for predicting the current market return in a regression model (Lander et al, 1997; Rolph and Shen, 1999;

Samanta and Bhattacharya, 2001).

Rolph and Shen (1999) first time directly evaluate the usefulness of the spreads between the stock market earnings yield and interest rates in predicting the future market movement in U.S. stock market. The authors provide an intuitive explanation on why the spreads may be useful in predicting the future market returns. The authors also accepted and applied the findings of Lander et al (1997). Moreover, the authors think that the spreads could be used for predicting the short-term market performance only.

Originally, the authors wanted to choose the S&P 500 index as the sample index. Due to the lack of information of dividend payouts and the 99 percent statistical correlation between the S&P 500 index and the Center for Research on Security Prices (CRSP) value-weighted index, they chose the latter as the sample index, which covered the time period from January 1962 to December 1997. For interest rates, the short-term interest rate, 3-month Treasury bill yield, and the long-term interest rate, 10-year Treasury note yield, were used. The dependent variable was the monthly total returns of the CRSP index. And the independent variable was the one-month lag of the spread because they cited that at most one lag is sufficient in their study.

Through a regression analysis, the authors found that the coefficients on the spread variable in both the short-term and long-term interest rate model were positive. It means that higher spreads lead to a more favorable outlook for the overall stock market or a higher market return; lower spreads lead to a more unfavorable

outlook for the overall market or a lower market return. But only when the 3-month Treasury bill yield was used as interest rate, the coefficient on the spreads was statistically significant.

Samanta and Bhattacharya (2001) examined the ability of the spreads between the stock market earnings yield and interest rates to predict the future market movement in emerging Indian stock market mainly based on Rolph and Shen (1999) and Shen (2000). The authors accepted the intuitive explanation on why the spreads may be useful in predicting the future market returns of Rolph and Shen (1999) and another argument on why the spreads may be useful for predicting the future market returns of Shen (2000).

The authors chose the BSE 100 index as the sample index of their study without debating its ability to represent Indian stock market. The sample covered the time period from January 1996 to December 2000. Both the weekly and monthly data were used. And only the short-term interest rates, the call money rate and the Bank Rate were used. Through the stepwise regression analysis, the important weekly or monthly lags of the spread, six weekly lags or three monthly lags were selected to be the independent variables in a regression model.

The authors found that the two results, which came from the weekly and monthly date respectively, were almost same. They indicated that there was a significant relationship between the spread between the stock market earnings yield and interest rate and the future market movement over the sample period.

The results of the section show that, to rational investors, the earnings yield

of individual stock or portfolio, the stock market earnings yield, the interest rate and the spread between the stock market earnings yield and interest rate are four of their benchmarks to select investment alternatives. The earnings yield of individual stock or portfolio is a benchmark of investors to select individual stock or portfolio. It has the positive relationship with the future return on the individual stock or portfolio and can be used to select the more profitable individual stock or portfolio. The other three items are looked as the benchmarks to select the investment alternatives between the stocks and other assets. And all of them have abilities to explain the future short-term market return and, thus, can be used as the predictors of the future short-term market return. Moreover, the spread is the best one among them.

2.2 Literature to Support Methodology

The linear regression (OLS) model is an important and popular methodology to find the predictors of the future stock market returns. Many papers, Clare et al (1994), Pesaran and Timmermann (1995), Lander et al (1997), Rolph and Shen (1999), and Samanta and Bhattacharya (2001), employed this model to investigate the abilities of many variables to explain/predict the future stock market returns. Especially, Rolph and Shen (1999) and Samanta and Bhattacharya (2001) directly investigated the ability of the spread to predict the future short-term market return in this model.

Rolph and Shen (1999) used a simple regression model to examine the

relationship between the one-month lag of the spread and the market return. Equation (2.8) was used in their study.

$$R_{t+1} = a + b \,[(E/P)_t - r_t] + error_{t+1} \qquad \textbf{(2.8)}$$

Where R_{t+1} was the monthly total returns of the CRSP value-weighted index at t+1 point; the $(E/P)_t$ was the earnings yield of the CRSP index at t point; r_t was the 3-month Treasury bill or the 10-year Treasury note interest rate at t point; $error_{t+1}$ was the difference between the actual value of R_{t+1} and the estimated value of R_{t+1}; a was the y-intercept of the line; and b was the slope of the line.

The authors used the standard test (AIC, Schwarz) to select the suitable lags of the spread. The test suggested that at most one lag is sufficient for all regression models studies in their papers. Therefore, only the one-month lag of the spread was selected to be the independent variable in their paper.

Through the linear regression analysis, the least squares line below was easily obtained.

$$R_{t+1} = a^* + b^* \,[(E/P)_t - r_t] \qquad \textbf{(2.9)}$$

Where R_{t+1}, a^*, and b^* were the estimated values of R_{t+1}, a and b in equation (2.8). The T-test was used to test whether there was a relationship between these two variables at a certain significance level. And the Durbin-Watson (D-W) test was also used to test whether the error terms were autocorrelated. Finally, the authors found that there was a positive significant relationship between the short spread (when the 3-month Treasury bill yield was used as interest rate) and the market return with a low value of R^2, and the error terms were not autocorrelated.

Samanta and Bhattacharya (2001) also used a linear regression model to examine the usefulness of the spread in predicting the future market return in Indian stock market. The basic linear equation below contained many lags of the spread.

$$R_t = a_0 + b_1 SP_{t-1} + b_2 SP_{t-2} + \cdots + b_k SP_{t-k} + e_t \qquad \textbf{(2.10)}$$

Where k was the suitably chosen positive integer; R_t was the market return at t point; SP_t was the spread between the stock market (BSE 100 index) earnings yield and interest rate at t point; a_0 was the constant; b_k was the coefficient of SP_{t-k}; and e_t was the error term at t point.

Based on this equation, the authors employed a stepwise regression approach, which is a widely used method to select variables and form a suitable model, to select the suitable lags of the spread. One important point in the procedure was to choose a reasonable upper limit. They selected the 12-month lag of the spread as the upper limit because this kind of study is only for short term. As a result, three monthly lags or six weekly lags were selected.

Similarly, the T-test and D-W test were used in their study. The results indicated that there was a significant relationship between the lags of the spread and the market return with a low value of R^2 and the error terms were not autocorrelated.

Obviously, the linear regression approach (OLS) is a kind of suitable methodology to investigate the relationship between the spread and the future short-term market return. And the model should include only those important lags of the spread, which could be chosen using stepwise regression technique or other methods.

2.3 Empirical Findings

Basu (1977) found that return on company stocks or portfolio with low P/E ratios was significantly higher than the return on companies or portfolio with relatively high P/E ratios over the sample period from 1957 to 1971 in U.S. stock market.

Jaffe et al (1989) found the positive relationship between the earnings yield and the stock return and the negative relationship between the market value and the stock return over the sample period from 1951 to 1986 in U.S. stock market.

Clare et al (1994) found that a distributed lag of the GEYR is a useful predictor of stock returns in UK stock market.

Pesaran and Timmermann (1995) found that interest rate is very important and useful for predicting future market return, especially, the one-month lagged value of the one-month Treasury bill rate, in U.S. stock market.

Lander et al (1997) got two findings over the sample period from 1979 to 1996 in U.S. stock market. First, the almost equal changes in the earnings yield and interest rate could not systematically influence stock returns during the following month. Second, when the earnings yield relative to the interest rate decreased, the stock return tended to become less in the following month; similarly, when the earnings yield relative to the interest rate increased, the stock return tended to become more in the following month.

Campbell and Shiller (1998) found that the relatively higher P/E ratios are

usually followed by lower stock price growth during the following decade in U.S. stock market.

Rolph and Shen (1999) found that higher spreads lead to a higher market return in the following month; and lower spreads lead to a lower market return in the following month in U.S. stock market.

Samanta and Bhattacharya (2001) found that there was a significant relationship between the spread between the stock market earnings yield and the interest rate and the future market return over the sample period from 1996 to 2000 in Indian stock market.

2.4 Summary

Through the review of the literature, the comparison of the selected studies can be clearly seen in table 2.2. And almost all the findings can be used as the major references to make investment decisions.

Clearly, the earnings yield is a quite useful indicator or predictor of future stock or market return in a regression model. And when the short-term market return is predicted, both the stock market earnings yield and interest rate should be considered in a regression model, especially, the spread between the stock market earnings yield and the short-term interest rate.

Before conducting the study, the researcher aimed to find the good predictors of the future short-term market return in the Thai stock market. Based on the

findings of the selected studies, the spread between the stock market earnings yield

and the short-term interest rate might be one of them. Therefore, the objective of the

study is to investigate the relationship between the spread between the stock market

earnings yield and the short-term interest rate and the future short-term market return

in the Thai stock market. Moreover, all those selected studies using the spread as

indicator for predicting the future short-term market return employed the linear

regression model. Following them, the linear regression model is used in the study.

Table 2.2 Comparison of the Selected Studies

Author	Objective	Method	Finding	Framework
Basu (1977)	To find the relationship between stock return and P/E ratio.	Linear regression	There was a significant negative relationship between stock return and P/E ratio in US market	$r_{pt} - r_{ft} = \alpha_{pt} + \beta_{pt}(r_{mt} - r_{ft}) + e_t$
Jaffe, Keim, and Westerfield (1989)	To re-examine the relation between the size and earnings yield effects in U.S. stock market.	Seemingly Unrelated Regression (SUR)	There was a positive relationship between stock return and earnings yield. There was a negative relationship between market value and stock return.	SUR model
Clare, Thomas, and Wickens (1994)	To investigate the ability of the GEYR for predicting UK stock returns.	Linear regression	Lags of GEYR are useful for predicting UK stock market return.	$\Delta \ln S_t = R(a_. \quad GEYR_{-1}) + e_t$
Pesaran and Timmermann (1995)	To examine the robustness of the evidence on predictability of U.S. stock returns.	Linear regression	Interest rates are important and useful for predicting stock market return.	$R_t = a \quad b_1 S_{t-} + b_2 EP_{-1} + b_3 I1 +b_4 I1_{-2} + \dots_{t-1}^{'} 1_{-1} + b_6 \quad 2_{t} + \cdot$
Lander, Orphanides and Douvogiannis (1997)	To forecast the market return using the equilibrium relationship between I/B and E/S in U.S. stock market.	Linear regression	1. Equal changes of e/p ratio and interest rate had no big effect on stock return. 2. Decreases in the earnings yield relative to the interest rate tended to reduce stock return in the following month.	$SPRET = a + k(EP_. - \rho R_{t-1}) + \varepsilon_t$
Campbell and Shiller (1998)	To investigate the relationships between market return and ratios.	Correlation	Higher P/E ratios are usually followed by low stock price growth in the following decade.	-
Rolph and Shen (1999)	To examine the usefulness of the spread for predicting the market return in U.S. stock market.	Linear regression	There is a significant positive relationship between the spread and future market movement.	$= a + b[(E/P) - r] + e_{t+}$
Samanta and Bhattacharya (2001)	To predict the future market return using the spread.	Linear regression	The significant relationship between the spread and future market return in Indian stock market	$R_t = a_0 + b_1 SP_{-1} + b_2 SP_{-2} + \dots + b_k SP_{-k} + e_t$

Chapter 3

Research Framework

This chapter presents both the theoretical and conceptual framework of the study based on the concepts and theories of the prior empirical studies as referred in chapter two and the specific situation of the Thai stock market. And the definitions of the variables are defined carefully also. Finally, the research hypothesis and the expected outcome are presented.

3.1 Diagram of Framework

According to the prior empirical studies, the spreads between the stock market earnings yield and the short-term interest rates do contain information on the future short-term stock market movement. Theoretically, there is a positive relationship between the spread between the stock market earnings yield and interest rate and the future short-term stock market return (Rolph and Shen, 1999; Shen, 2000). Especially, the one-month lag of the spread could be the representative regressor to explain the current market return in a regression model in U.S. stock market. For example, Rolph and Shen (1999) used equation (2.8) as the conceptual framework, in which, the one-month lag of the spread between the stock market earnings yield and the three-month Treasury bill interest rate was representative for the past values of the spread, to investigate the relationship between the past values

of the spread and the current month stock market return. The result indicates that there is a significant positive relationship between the one-month lag of the spread and the current month market return in U.S. stock market. And Samanta and Bhattachaya (2001) used equation (2.10) as the theoretical framework to investigate the relationships between the past values of the spreads between the stock market earnings yield and interest rates and current market return in Indian stock market. And the authors found the significant relationships between the lags of the spreads and the current market return.

3.1.1 Theoretical Framework

Following Rolph and Shen (1999) and Samanta and Bhattacharya (2001), the theoretical framework of the study is presented below:

Figure 3.1 Theoretical Framework

Independent variables (X)   Dependent variable (Y)

| Lags of the spread between the stock market earnings yield and the short-term interest rate | Market return (future stock market movement) |
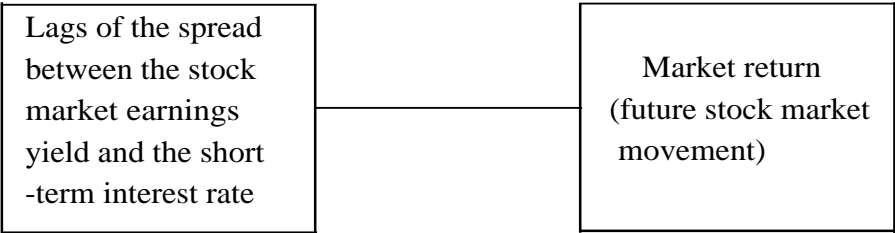
Equation:

$$R_t = a_U + b_1 SP_{t-1} + b_2 SP_{t-2} + \cdots + b_k SP_{t-k} + e_t \qquad \textbf{(3.1)}$$

Where k is the suitably chosen positive integer; R_t is the monthly market return at t point[5]; SP_{t-1} is the spread between the stock market earnings yield and the short-term interest rate at t-1 point; a_U is the constant and the b_K is the coefficient of SP_{t-K}, e_t is the error term at t point.

3.1.2 Conceptual Framework

Based on the theoretical framework above and the specific situation in Thailand, the researcher develops the conceptual framework below:

Figure 3.2 Conceptual Framework

Independent variable (X)   Dependent variable (Y)

One-month lag of the spread between the SET earnings yield and the three-month government bond interest rate		Return on the SET index (future the SET movement)

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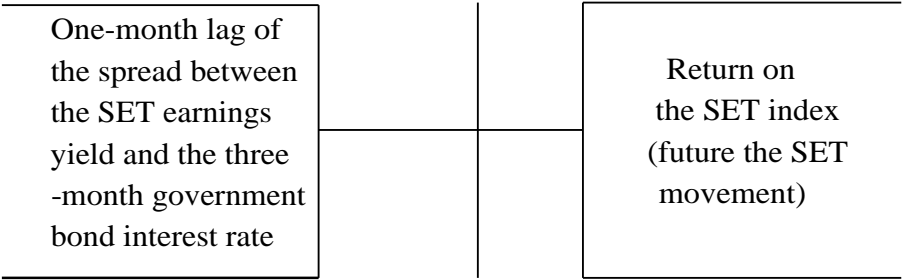
[5] Point "t" is any a month end in the period from January 1998 to December 2002.

Equation:

$$R_t = a + b \left[(E/P)_{t-1} - r_{t-1} \right] + \text{error } t \qquad \textbf{(3.2)}$$

Where R_t is the monthly SET index return at t point; $(E/P)_{t-1}$ is the SET earnings yield at t-1 point; r_{t-1} is the three-month government bond interest rate at t-1 point; and error_t is the difference between the actual market return and the estimated market return at t point.

The procedure to form the conceptual framework and the consistency of the theoretical and conceptual framework will be discussed in detail in the definition of variables part of the study.

3.2 Definition of Variables

In the theoretical framework of the study, four terms including the independent variables-lags of the spread between the stock market earnings yield and the short-term interest rate, the dependent variable-market return, the stock market earnings yield, and the short-term interest rate should be defined and explained carefully because they have very specific meanings in the study. And the conceptual framework is formed based on their specific meanings in the study.

Stock market earnings yield is the SET earnings yield or E/P ratio, in which, the earnings are the total earnings of the SET index companies for the previous four quarters, and the price is the latest end of the month price. For example, the E/P ratio for December 2000 can be calculated as follows: the denominator is weighted

average of the stock prices in the SET index at December 31, 2000, with the weights update to the same day; the numerator is the total weighted average earnings of the companies in the SET index for the forth quarter of 1999, and the first, second, and third quarter of 2000, with the weights updated to the end of September 2000[6].

Short-term interest rate is the three-month government bond interest rate. The selection of an appropriate interest rate plays an important role in the study. But it is not easy because there are many kinds of interest rates; especially, both the short-term and the long-term interest rates can be used in this kind of study. Rolph and Shen (1999) have discussed the issue in detail and argued that the short-term interest rates, especially, the three-month government bond interest rate, may be more relevant in evaluating the usefulness of the spread. Their results also affirm this position. In the study, the three-month government bond interest rate is selected as the short-term interest rate based on the argument and empirical results of Rolph and Shen (1999).

Lags of the spread between the stock market earnings yield and the short-term interest rate is the one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate. Lags of the spread are the past values of the spread, for example, when the point at December 31, 2000 is selected, the one-month lag of the spread should be the one at the end of November 2000, and the twelve-month lag of the spread should be the one at the end of December 1999.

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[6] The method used to calculate the SET P/E ratio comes from the Call Center of the Stock Exchange of Thailand.

How to select the independent variables or lags of the spread is a very important but quite hard task. Up to now, a widely used strategy is the stepwise regression approach (Davidson et al, 1978; Samanta and Bhattacharya, 2001). Using this approach, an upper limit of the independent variables or lags should be fixed first and some important independent variables or lags will be selected through an analysis procedure, which includes the removal of the variables or lags. In the first step, the independent variable or lag with the largest t value is selected as the best one-variable predictor of the dependent variable. And then, the best two or three or more independent variables or lags are selected in the subsequent steps. Finally, the important independent variables or lags are selected to form a suitable model. In the study, the twelve-month lag of the spread is selected as the upper limit lag because the researcher aims to predict the short-term stock market outlook. In a SPSS program, the researcher selects the linear regression first and then stepwise; after that, the 48 months (from January 1999 to December 2002) data of the return on the SET index is input as the dependent variable and, accordingly, the 48 months (from January 1999 to December 2002) data of the 1-12-month lags of the spread is input as the independent variables. As a result, only the one-month lag of the spread is selected as the important lag of the spread, which is representative for the 1-12-month lags of the spread and the independent variable in the conceptual framework in the study.

Market return is the SET return. Normally, it contains two parts, the

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[7] McClave et al, 2001, pp. 626-28.

received cash dividends and the capital gains (or losses). In the study, Considering the specific situation in the SET and following Samanta and Bhattacharya (2001), the study uses only the return on the SET index-the monthly capital gains (or losses), the difference between the SET index at t point and the SET index at t-1 point divided by the SET index at t-1 point, as the monthly market return at time point t. There are two reasons. One is the value of the dividends is very small relative to the capital gains (or losses). The other is the data limitation.

Clearly, the spread between the SET earnings yield and the three-month government bond interest rate represents the spread between the stock market earnings yield and the short-term interest rate in the Thai stock market-the SET. And the one-month lag of the spread-the independent variable in the conceptual framework, which is selected using the stepwise regression technique based on the theoretical framework, can represent the lags of the spread to explain the return on the SET index. Moreover, the return on the SET index is the market return in the Thai stock market. Therefore, the conceptual framework and theoretical framework are consistent in the study.

3.3 Research Hypothesis

In the study, the researcher investigates the following hypothesis:

H_o: There is no significant relationship between the one-month lag of the spread between the SET earnings yield and the three-month government bond

interest rate and the return on the SET index at 5% level of significance.

H$_a$: There is a significant relationship between the one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate and the return on the SET index at 5% level of significance.

3.4 Expected Outcome

The results of the selected studies indicate that there is a significant relationship between the spread between the stock market earnings yield and the short-term interest rate and the future short-term stock market return in some countries. And a higher spread between the stock market earnings yield and interest rate imply a higher market return in U.S. stock market.

So the researcher expects the study outcome as follows:

There is a significant positive relationship between the one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate and the return on the SET index.

Chapter 4

Research Methodology

This chapter shows the procedure to select the population and the data source. Data collection and measurement are also explained in this chapter. Finally, the data analysis is explained in the last section.

4.1 Data Source: Target Population & Sampling Procedure

4.1.1 Population Selection

Before showing the data source of the study, the researcher explains the selection of the population of the study, which shows the range of the data needed in the study.

The objective of the study is to investigate the relationship between the spread between the stock market earnings yield and the short-term interest rate and the future short-term market return in the Thai stock market. Based on this, obviously, some data needed in the study should come from the market portfolio or sample portfolio, which is representative for the market portfolio of the Thai stock market, the SET.

There were relatively few listed companies, 389 companies, at the end of 2002 totally on the SET. Moreover, the data of the market portfolio (SET) P/E ratio and price index are available publicly. Therefore, the researcher directly selects the

population, the market portfolio (SET).

4.1.2 Data Source

One of the most important issues of financial research is where the data can be found. The latest secondary monthly data of the SET P/E ratio, three-month government bond interest rate, and SET index can be obtained easily from the public mediums such as www.set.or.th, www.bot.or.th, the Asian Wall Street Journal and so on. This makes the investors convenient to apply the finding of the study. Due to the selected relatively long time period from 1998 to 2002, the major data needed in the study should come from the widely used economic database, for example, the Census and Economic Information Center (CEIC) database, which is available at the library of Assumption University (ABAC). Table 4.1 gives the source of the data.

Table 4.1 Data Source of the Study

Data	Source
- Monthly SET P/E ratio - Monthly SET index - Monthly three-month government bond interest rate	Census and Economic Information Center (CEIC) database, Thailand

4.2 Data Collection

The researcher obtained the monthly data of the SET P/E ratio, three-month government bond interest rate and SET index, which cover the time period from January 1998 to December 2002, from the CEIC database directly.

Based on these data, all other data needed, the monthly SET earnings yield, one-month lag of the spread between the SET earnings yield and the three-month government interest rate, and monthly return on the SET index, in the study can be obtained through simple calculations. The monthly SET earnings yield is the reciprocal of the monthly SET P/E ratio. That is, monthly SET earnings yield = 1 / monthly SET P/E ratio = total earnings for the previous four quarters / total market value at the end of this month. The monthly spread is the difference between the SET earnings yield and the three-month government bond interest rate at each point. That is, monthly spread = the SET earnings yield at t point – the three-month government bond interest rate at t point. The monthly return on the SET index is computed as the percentage change of the SET index in one month. That is, monthly return on the SET index = (SET index at t point – SET index at t-1 point) / SET index at t-1 point.

Moreover, for the data of the return on the SET index, only 48 months (from January 1999 to December 2002) data are needed in the study because 1-12-month spreads will be used in the stepwise regression to select the important lags. Thus, only the 48 months data of the independent and dependent variable are used in the regression model. And all the data and calculations mentioned above will be shown

in detail in appendix I in the study.

4.3 Data Measurement

Table 4.2 is the operatioanlization table of the independent and dependent

variable of the study.

Table 4.2 Operationalization Table of the Independent and Dependent Variable

Variable to be tested	Operationalization	Measurement level
Dependent variable Return on the SET index	(SET index at t point – SET index at t-1 point)/SET index at t-1 point	Ratio
Independent variable One-month lag of the spread between the SET earnings yield and the three-month government bond interest rate	SET earnings yield at t-1 point — three-month government bond interest rate at t-1 point	Ratio

Note: Point "t" is any a month end in the period from January 1998 to December 2002.

4.4 Data Analysis

After finishing the previous steps, all the data needed to investigate the relationship between the one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate and the return on the SET index are completely available. In a SPSS program, the regression model is employed to develop an estimated linear equation of the two variables. Then, the T-test is used for the significant relationship hypothesis testing. Finally, the scatterplot is used to identify the nonconstant variance problem of the values of error term.

4.4.1 Table of Hypothesis & Statistics

Table 4.3 Hypothesis & Statistics

Hypothesis	Statistics used
Ho : There is no significant relationship between the one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate and the return on the SET index at 5% level of significance H_o: $b = 0$	Regression

Using the linear regression methodology, the researcher can determine whether a relationship between the spread and the future Thai stock market return exists, the strength of the relationship, the mathematical equation relating the spread and the future Thai stock market return, and the future Thai stock market return through the equation. It means that the linear regression methodology is suitable for the study. Moreover, Rolph and Shen (1999) and Samanta and Bhattachaya (2001) employed the linear regression methodology to investigate the relationship between the spread and the future market return. Therefore, the linear regression methodology is employed in the study.

4.4.2 Diagnosis of Statistics Methods

Ordinary Least Squares (OLS)

The Ordinary Least Squares (OLS) method is the most commonly used technique to fit the regression line, for which the sum of square errors (SSE) is a minimum. There are two reasons to employ the OLS method in the study. First, the OLS can fit a regression line that minimizes the SSE, which is a measure of total error and thus, the regression line can produce a relatively accurate estimated value of the dependent variable. Second, Rolph and Shen (1999) and Samanta and Bhattacharya (2001) employed the OLS method in their studies; for example, Rolph and Shen (1999) mentioned "the in-sample regression is an exercise to find the correlations between the explanatory variables and the dependent variable which

minimize the variance of the residuals." and the D-W test is used to test the validity

of one of the OLS assumptions in these two papers.

Based on the regression equation (3.2), the researcher will select the linear

regression in a SPSS program, and then input the 48 months (from January 1999 to

December 2002) data of the return on the SET index as the dependent variable and

the 48 months (from January 1999 to December 2002) data of the one-month lag of

the spread as the independent variable. Thus, the estimated equation can be obtained

and expressed as below:

$$\hat{R}_t = a^* + b^* [(E/P)_{t-1} - r_{t-1}] \qquad \textbf{(4.1)}$$

Where $\hat{R}_t$ is the estimated value of R_t, and a^* and b^* are the estimators of a and b,

respectively.

If b^* is greater than 0, it means that there is a positive relationship between

the one-month lag of the spread between the SET earnings yield and the three-month

government bond interest rate and the return on the SET index; if b^* is less than 0, it

means that there is a negative relationship between these two variables.

T-test

After getting the estimated equation above, it is necessary to test the

hypothesis in order to investigate whether the return on the SET index has a

significant relationship with the one-month lag of the spread between the SET

earnings yield and the three-month government bond interest rate at 95% confidence

level or not using the T-test.

Based on the four assumptions of the OLS, the least squares estimator b^* of the slope will have a normal distribution with mean b (the true slope). And the T-test produces the value of "t" calculation (t_{cal}) which equals b^* divided by its standard deviation. To compare with the value of "t" table (t_{tab}) at a certain significance level, the value of (t_{cal}) could conclude whether b (the true slope) equals 0 or not. If b = 0, it means the independent variable has no ability to explain/predict the dependent variable at the significance level. If b≠0, it means the independent variable can explain/predict the dependent variable at the significance level. This is the main reason for which the T-test is used in the study. Moreover, Rolph and Shen (1999) and Samanta and Bhattacharya (2001) used the T-test to test significant relationships between variables.

In this study, if the absolute value of "t" calculation (t_{cal}) is greater than the absolute value of "t" table (t_{tab}) or the P value is less than 0.05, the null hypothesis will be rejected. It means that there is a significant relationship between the one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate and the return on the SET index at 95% confidence level. In contrast, if the absolute value of the t_{cal} is equal or less than the absolute value of the t_{tab} or the P value is equal or greater than 0.05, the null hypothesis will be accepted. It implies that there is no significant relationship between these two variables at 95% confidence level.

Coefficient of determination (R^2)

In most researches investigating the linear relationship of variables, the R^2 plays an important role to explain the relationship. The value of R^2 measures the proportion of variation in one variable that is explained by the other or others. In this study, it means that the change of the one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate can explain how many percent of the change of the return on the SET index.

Scatterplot (Standardized residuals versus standardized predicted values)

Scatterplot (standardized residuals versus standardized predicted values) is used to plot the spreads to identify the problem of nonconstant variance of the values of error term. In the figure of the scatterplot, the horizontal axis represents the standardized predicted value, which is "the predicted value standardized by subtracting the mean of the dependent variable and dividing by the standard deviation of the predicted values"; the vertical axis represents the standardized residual, which equals "the ordinary residual divided by the sample standard deviation of the residuals".

In the figure, if the observations of the error terms fall in a horizontal band across the plot and a systematic trend cannot be found, it means that there is no nonconstant problem of the values of error term in the study.

Chapter 5

Data Analysis

This chapter shows the profile of the population. The regression line with some statistics values is presented and the analyses of the statistic values and the figure of the scatterplot are explained also. Finally, the result is carefully explained.

5.1 Profile of the Population

Based on the 48 months data of the one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate and the return on the SET index in the period from January 1999 to December 2002 and equation (3.2) in the study, the real values of the return on the SET index are estimated by OLS regression at 95% confidence interval. Figures 5.1-5.4 show the real values of the monthly SET earnings yield, the monthly three-month government bond interest rate, the monthly one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate and the monthly return on the SET index in the period.

Figure 5.1 Monthly SET Earnings Yield (from December 1998 to November 2002)
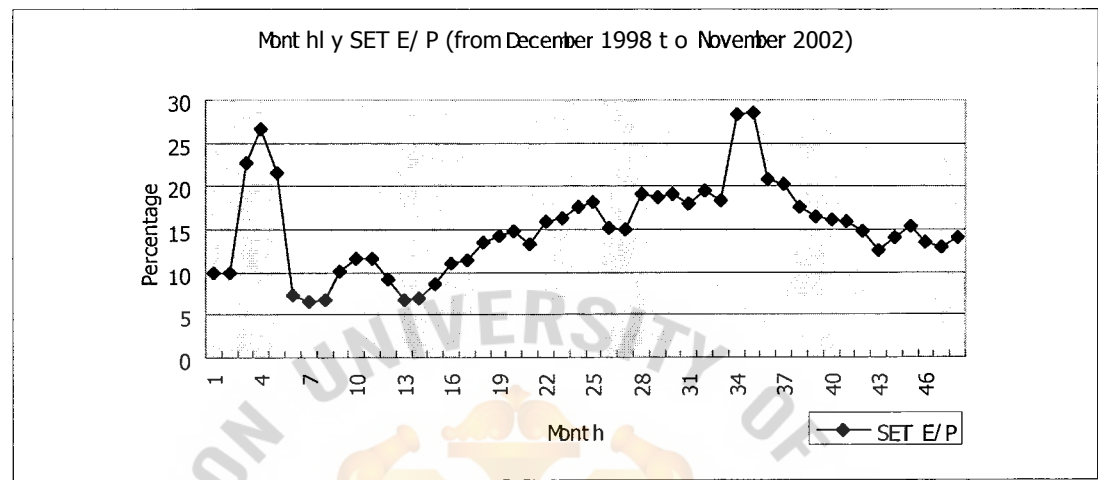
Source: Census and Economic Information Center database

Figure 5.2 Monthly 3-Month Government Bond Interest Rate (from December 1998 to
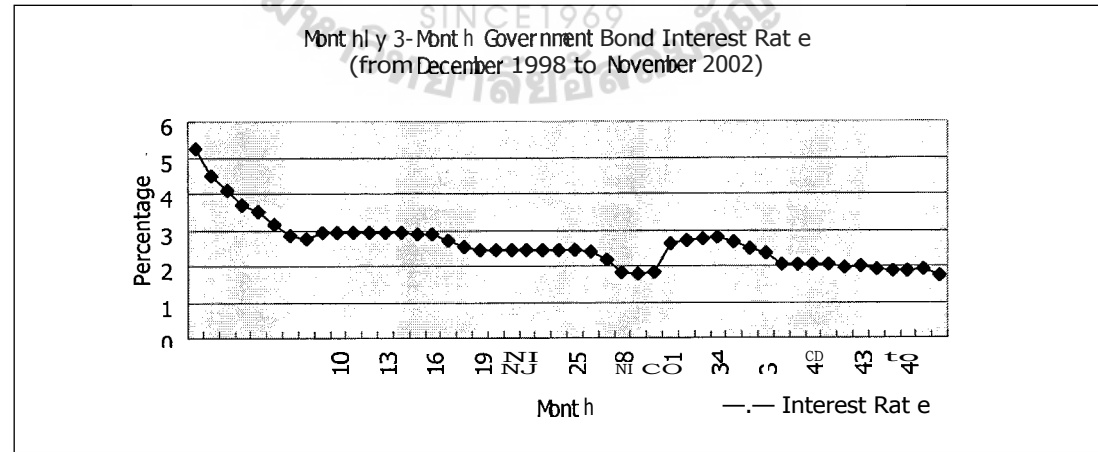
November 2002)

Source: Census and Economic Information Center database

Figure 5.3 Monthly 1-Month Lag of Spread (from January 1999 to December 2002)
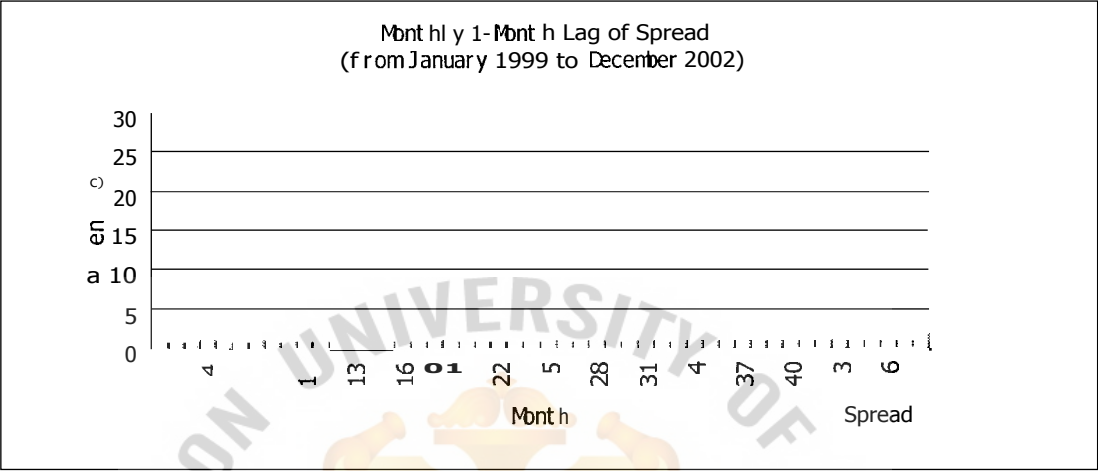
Source: Adapted from Census and Economic Information Center database

Figure 5.4 Monthly Return on the SET Index (from January 1999 to December 2002)
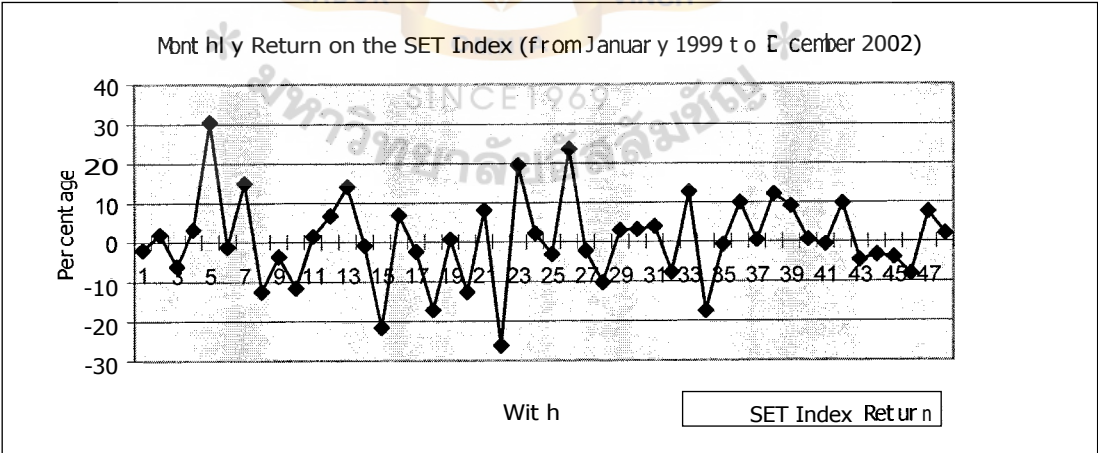
Source: Adapted from Census and Economic Information Center database

5.2 Testing Result

In this section, the results of both the hypothesis test and the OLS assumption test are presented and explained.

5.2.1 Hypothesis Test Result

According to the statistics values in table 5.1, equation (3.2) in chapter 3 is estimated as follows:

$$R_t = -7.687 + 0.661[(E/P)_{t-1} - r_{t-1}] \qquad \textbf{(5.1)}$$

Where R_t is the estimated return on the SET index at t point; -7.687 is the estimated value of a in equation (3.2) and taken from the unstandardized coefficient of constant in table 5.1; 0.661 is the estimated value of b in equation (3.2) and taken from the unstandardized coefficient of spread1 in table 5.1; $(E/P)_{t-1}$ is the SET earnings yield at t-1 point; r_{t-1} is the three-month government bond interest rate at t-1 point; $[(E/P)_{t-1} - r_{t-1}]$ is the spread at t-1 point.

Analysis of the statistic values in table 5.1

Using this model of equation (3.2), the absolute value of T_{cal} of the spread1, 2.341, is greater than the absolute value of T_{tab}, 2.0129, or P $= 0.024 < 0.05$. Therefore, the null hypothesis is rejected. It means that there is a significant

relationship between the independent variable-one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate and the dependent variable-return on the SET index at 5% level of significance.

Moreover, the coefficient of the spread1 is positive. It means that there is a positive relationship between the independent variable-one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate and the dependent variable-return on the SET index. And the value of R^2 is 0.106. It indicates that the change of the one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate can explain 10.6 percent of the change of the return on the SET index.

Table 5.1 The Result by OLS Estimation

Equation	Variables	Unstandardized Coefficient	T value	Significance	R^2
(3.2)	Constant	-7.687	-1.995	0.052	0.106
	Spread1	0.661	2.341	0.024	

Note: Spread1 stands for the one-month lag of the spread.
  These statistic values are taken from the tables of Model Summary and Coefficients[a] in appendix II -SPSS output.

5.2.2 OLS Assumption Test Result

The result of the OLS assumption test is presented as follows:

Table 5.2 Validity of OLS

Equation	Plot Spread (See figure 5.5)
(3.2)	Perfect Form

Analysis of figure 5.5

In figure 5.5, the observations of the error terms fall in a horizontal band across the plot and have no systematic trends. Therefore, the figure has a perfect form and means that most observations of the error term are drawn from the distribution with the constant variance. It corresponds with the OLS assumption of constant variance of the values of error term.

5.3 Explanation of the Result

In fact, the result shown above is what the researcher expected in accordance

with theory. It is consistent with the study expected outcome-there is a significant positive relationship between the one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate and the return on the SET index.

Equation (5.1) shows the positive relationship between the one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate and the return on the SET index. And the relationship is significant at 5% level of significance but not strong. All these are almost same as the result of Rolph and Shen (1999). It also consists with the theoretical positive relationship between the spread of the stock market earnings yield and interest rate and the future market return.

Particularly, surprising news here is the value of the R^2, 0.106. In most financial researches about the predictability of the stock market return, a single predictor of the stock market return rarely produced the value of R^2, which was greater than 0.1. Rolph and Shen (1999) found that the one-month lag of the spread, as a single predictor of the stock market return, produced a value of the R^2 around 0.02. And Pesaran and Timmermann (1995) developed a better model including nine indicators[8] to predict the stock market return and still got a range of the R^2 from 0.1 to 0.25 over different sample periods. But almost all the researchers accepted the relatively weak relationship between the stock market return and those predictors

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[8] The nine indicators of the stock market return are 1-month lag of the dividend yield, 1-month lag of stock market E/P ratio, 1-month lag of the 1-month T-bill rate, 2-month lag of the 1-month T-bill rate, 1-month lag of the 12-month T-bond rate, 2-month lag of the 12-month T-bond rate, 2-month lag of the year on year rate of inflation, 2-month lag of the year-on year rate of change in industrial output and one other variable.

and used them either together or alone to predict the stock market return. Especially, when the value of the R^2 was greater than 0.1, the explanatory power of the predictor or predictors were absolutely accepted. Moreover, in the same period from 1998 to 2002, the one-month lag of the SET earnings yield, as a single predictor of the return on the SET index, can produce a value of R^2 around 0.08 and the relationship is significant at 90% confidence level; and the one-month lag of the three-month government bond interest rate can produce a value of R^2 around 0.003 but the relationship is not significant at 90% confidence level. This fact is consistent with the explanation of Shen (2000) that in predicting the monthly stock market return, a combination of the stock market earnings yield and interest rates usually performs better than either the stock market earnings yield or interest rates alone. Therefore, the one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate can be used as a better predictor of the return on the SET index.

All in all, a higher spread between the SET earnings yield and the three-month government bond interest rate leads to a higher SET return in the following month in the Thai stock market.

Figure 5.5 Scatterplot

Scatterplot

Dependent Variable: return
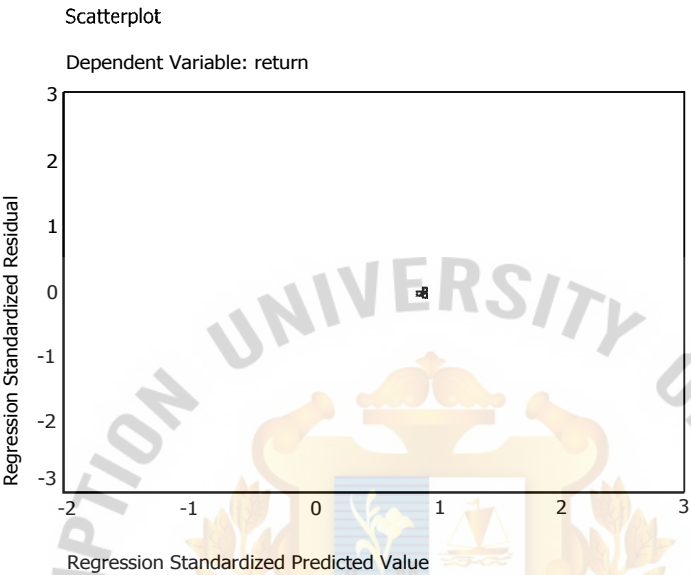
Chapter 6

Conclusion and Recommendation

This chapter shows the conclusion of the study and its implication. And the recommendations of the study are provided. Finally, further studies needed to investigate the relationship between the spread between the stock market earnings yield and the short-term interest rate and the future short-term movement of the Thai stock market are suggested also.

6.1 Conclusion & Implication

The researcher assumes that the short-term stock market returns can be partially predicted by means of publicly available information and a set of financial and macroeconomic indicators can be used as the predictors. The stock market earnings yield and the short-term interest rate are two of such indicators. Using a regression model, this research explores the relationship between the spread between the stock market earnings yield and the short-term interest rate and the future short-term stock market return over the sample period from 1998 to 2002 in Thailand.

The result shows that the future short-term market return has a significant positive relationship with the spread between the stock market earnings yield and the short-term interest rate with a relatively low value of R^2 in Thailand. It means that

the spread could be a predictor to explain future short-term movement of the Thai stock market. And a higher spread leads to a higher stock market return in the following month in Thailand. But the explanatory power of the spread is not strong.

The significant positive relationship between the spread and the market return may mean that publicly available information, especially, financial and macroeconomic indicators, do have the ability to explain the current market return in the Thai stock market. It consists with the assumption that the Thai stock market has Semistrong-form efficiency in the study.

The Thai stock market was a very profitable and attractive market in the period from 1998 to 2002. In the period, the SET earnings yield had a range from 5% to 30% and an average level of around 14%; the three-month government bond interest rate had an average level of around 4%; accordingly, the spread between the SET earnings yield and the three-month government bond interest rate had an average level of around 10%. In the same time period in U.S. stock market, the S&P 500 earnings yield had an average level of around 3.3% and the spread between the S&P 500 earnings yield and the three-month Treasury bill interest rate had an average level of around negative 0.7%. Moreover, in the time period from 1981 to 2002, the average SET earnings yield was around 9.5% and the average spread between the SET earnings yield and three-month fix deposit interest rate was around 1%. Therefore, both in absolute and relative term, the yield of the Thai stock market in the period from 1998 to 2002 was very high. Obviously, the high

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[9] The 3-month fix deposit interest rate is used here because the limited information about the 3-month government bond interest rate began from 1996 and, in the period from 1998 to 2002, the average spreads measured by these two kinds of interest rates were almost equal, around 10%.

profitability relative to other investment alternatives could make investors obtain higher return from listed companies than what they get from bonds issuers or commercial banks assuming the investors keep their stocks for a long time. In the period, of course, the level of the risk of the SET was relatively high because of the process of the recovery from 1997 economic and financial crisis of the Thai economy and the weak confidence of the investors on the SET. From another perspective, it means that the investors are very rational. And when they choose the short-term investment alternatives, they may care more about the spread. They adjust their investment strategies with the changes of the spread. When the spread becomes higher and higher, more and more funds will flow in the Thai stock market to earn high profits. Similarly, when the spread becomes lower and lower, more and more funds will leave the Thai stock market and flow in other markets.

The Thai stock market is an open market and many foreign investors (individuals and institutes) participate in the market. They may invest directly on the SET or through the foreign funds. For the individual foreign investors, they are also exempt from taxation on capital gains arising from trading of SET securities. In the past few years, foreign investors' turnover kept at a relatively stable level, around 30 percent of total turnover. It means that the foreign investors trade actively for the short-term profit in the Thai stock market. The major reason that the foreign investors invest their money in the Thai stock market most likely is the high relative profitability (spread) of the Thai stock market. Absolutely, before investing their money in the Thai stock market, the foreign investors need to make a careful choice

among investment alternatives worldwide. And the value of the spread between the stock market earnings yield and the short-term interest rate most likely becomes their basic benchmark to make a decision whether they invest their money in the Thai stock market or not. Moreover, their strategies and behaviors can largely influence domestic investors and some domestic investors will follow them. Those foreign investors constantly transfer their money among different markets. When the spread is high, they will invest their money in the Thai stock market; when the spread is low, they will invest their money in other markets.

Moreover, individual investors dominate the Thai stock market trading and represent about 70% of total turnover. Most of these individual investors are either speculators seeking quick gains or short-term investors. This fact, together with the tax exemption for capital gains of individual investors, favors trading behavior rather than long-term investing. Thus, to a large extent, the stock prices change with the changes of the individual investors' short-term investment decisions.

Therefore, in the Thai stock market, an internationalized market, rational investors may make the short-term investment decisions mainly based on the spread-relative profitability of the Thai stock market and keep the spread at a relatively high level. It is the possible reason why there is a significant positive relationship between spread between the stock market earnings yield and the short-term interest rate and the future short-term stock market return in Thailand. The possible reason also consists with the last two assumptions of the study.

6.2 Recommendation

Investors participate in the Thai stock market for higher return, which is mainly related to the stock prices movement. Financial analysts explain the future stock market trend and develop specific individual stock or portfolio trading strategies mainly based on their expectation of the future stock prices as well. Therefore, a relatively accurate estimation of the future stock prices is very important for them.

Based on the result discussed in the previous chapter, the one-month lag of the spread between the SET earnings yield and the three-month government bond interest rate could be a predictor of the current return on the SET index. The investors and financial analysts should take advantage of the finding of the study to predict the one-month-ahead return on the SET index and hence, they can know the direction of future stock prices in the SET. A better method to forecast the one-month-ahead return on the SET index is the rolling regression technique as discussed below because financial time series are volatile.

The rolling regression goes as follows: First, the result of the study, equation (5.1) is used to forecast the return on the SET index for the next month, January 2003. Then the 49 months (from January 1999 to January 2003) data of the one-month lag of the spread and the return on the SET index is used to re-estimate the model of equation (3.2) and the update estimated equation could be obtained. Finally, the updated estimated equation is used to forecast the return on the SET

index for February 2003, and so on.

After that, based on the predicted return on the SET index, the market model (equation 6.1) could be used to forecast the specific individual stock return. And the rolling regression should be used also.

$$R_{at} = a + \beta R_{mt} + error_t \qquad (6.1)$$

Where R_{at}= return on stock a in month t;

R_{mt}= return on the SET index in month t;

a = intercepts;

ß = slopes.

Moreover, the one-month lag of the spread could be used as a predictor of the return on the SET index in any other linear regression models, which include some other possible explanatory variables of the return on the SET index.

Under normal situation, another important application of the spread is to use the extreme values of the spread relative to its historical range as an indicator of the overall market condition. Therefore, investors could find a better time point to buy or sell stocks. An extreme high value of the spread may mean that the stock market is very profitable relative to other investment alternatives and thus, more and more funds will flow in the market and a higher market return could be expected. Therefore, a time point with an extreme high value of the spread should be a better time point to buy stocks. Similarly, an extreme low value of the spread may mean that stock prices tend to grow slowly or fall and thus, a better time point to sell stocks appears. In the application, investors must be cautious about two problems.

First, investors' perceptions about the level of risk of the stock market may change with the changes of the national economy situation. For example, most investors may think that the level of the risk of the SET in 2003 is much less than it was in 1998 because of the different national economy situations. Therefore, investor may have different expected returns from the investments in the SET. As a result, the extreme values of the spread should change accordingly. Second, in real practice, the spread and the market return do not match exactly. In terms of the short-term market return, investors should consider the specific market situation in the past year, especially, in the past few months.

6.3 Suggestion for Further Study

There are some limitations to investigate the relationship between the spread between the stock market earnings yield and the short-term interest rate and the future short-term stock market return in Thailand in the study. Therefore, the result of the study is tentative and some further studies need to be conducted.

First, in the study, only the risk-free rate-three-month government bond interest rate is chosen as the representative of the short-term interest rate. In the further study, some other short-term interest rates, for example, three-month fixed deposit interest rate, six-month fixed deposit interest rate, one-month government bond interest rate, and six-month government bond interest rate, should be used to measure the spread. And the usefulness of the spreads in explaining the future SET

return should be compared.

Second, in the study, only the monthly data is used. In the further study, if the data needed are available, the weekly or quarterly data should also be used to investigate the relationship between the spread and the future SET return to know whether the weekly or quarterly spread could be the predictor of the weekly or quarterly future SET return or not.

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APPENDICES

Appendix I: Data & Calculation

A: Raw data getting

The secondary monthly data of the SET index, the SET P/E ratio and the three-month government bond interest rate are obtained from the CEIC database.

Month End	SET Index	SET P/E Ratio	3-Month Government Bond Rate
Dec-97	372.69	/	/
Jan-98	495.23	8.94	15.16
Feb-98	528.42	8.94	14.7
Mar-98	459.11	13.31	13.81
Apr-98	412.13	15.49	15.1
May-98	325.59	12.66	16.11
Jun-98	267.33	10.72	15.41
Jul-98	266.72	10.5	13.1
Aug-98	214.53	8.03	12.98
Sep-98	253.82	9.53	7.99
Oct-98	331.29	10.38	7.07
Nov-98	362.82	9.76	6.29
Dec-98	355.81	10.04	5.25
Jan-99	363	10.15	4.51
Feb-99	340.94	4.39	4.11
Mar-99	352.01	3.75	3.67
Apr-99	459.35	4.64	3.51
May-99	453.6	13.55	3.17
Jun-99	521.77	15.35	2.83
Jul-99	456.81	14.62	2.76
Aug-99	440.27	9.93	2.94
Sep-99	389.49	8.66	2.94
Oct-99	395.55	8.66	2.938
Nov-99	422.12	10.88	2.938
Dec-99	481.92	14.7	2.938
Jan-00	477.57	14.35	2.9375

Feb-00	374.32	11.61	2.89145
Mar-00	400.32	9.06	2.88043
Apr-00	390.4	8.73	2.72059
May-00	323.29	7.37	2.53947
Jun-00	325.69	7.06	2.45
Jul-00	284.67	6.71	2.4375
Aug-00	307.83	7.51	2.4375
Sep-00	227.29	6.28	2.4375
Oct-00	271.84	6.13	2.4375
Nov-00	277.92	5.67	2.4375
Dec-00	269.19	5.52	2.4375
Jan-01	332.77	6.57	2.41811
Feb-01	325.2	6.64	2.17619
Mar-01	291.94	5.24	1.82023
Apr-01	300.63	5.31	1.79567
May-01	310.13	5.24	1.82505
Jun-01	322.55	5.55	2.60614
Jul-01	297.69	5.15	2.7281
Aug-01	335.57	5.47	2.73409
Sep-01	277.04	3.54	2.779
Oct-01	275.09	3.52	2.645
Nov-01	302.62	4.82	2.49409
Dec-01	303.85	4.92	2.34944
Jan-02	340.82	5.7	2.06136
Feb-02	371.81	6.09	2.02947
Mar-02	373.95	6.23	2.06571
Apr-02	371.42	6.27	2.02684
May-02	407.96	6.72	1.9625
Jun-02	389.1	7.95	1.981
Jul-02	376.02	7.09	1.92857
Aug-02	361.16	6.54	1.85048
Sep-02	331.79	7.41	1.87238
Oct-02	357.22	7.68	1.89
Nov-02	364.9	7.07	1.73286
Dec-02	356.48	6.98	1.71056

B: The calculation & data of the monthly SET earnings yield

The monthly SET earnings yield is the reciprocal of the monthly SET P/E ratio.

That is, Monthly SET earnings yield = 100 / monthly SET P/E ratio.

Month End	SET P/E Ratio	SET Earnings Yield
Jan-98	8.94	11.18568233
Feb-98	8.94	11.18568233
Mar-98	13.31	7.513148009
Apr-98	15.49	6.455777921
May-98	12.66	7.898894155
Jun-98	10.72	9.328358209
Jul-98	10.5	9.523809524
Aug-98	8.03	12.45330012
Sep-98	9.53	10.49317943
Oct-98	10.38	9.633911368
Nov-98	9.76	10.24590164
Dec-98	10.04	9.960159363
Jan-99	10.15	9.852216749
Feb-99	4.39	22.77904328
Mar-99	3.75	26.66666667
Apr-99	4.64	21.55172414
May-99	13.55	7.380073801
Jun-99	15.35	6.51465798
Jul-99	14.62	6.83994528
Aug-99	9.93	10.07049345
Sep-99	8.66	11.54734411
Oct-99	8.66	11.54734411
Nov-99	10.88	9.191176471
Dec-99	14.7	6.802721088
Jan-00	14.35	6.968641115
Feb-00	11.61	8.613264427
Mar-00	9.06	11.03752759
Apr-00	8.73	11.45475372

May-00	7.37	13.56852103
Jun-00	7.06	14.16430595
Jul-00	6.71	14.90312966
Aug-00	7.51	13.31557923
Sep-00	6.28	15.92356688
Oct-00	6.13	16.3132137
Nov-00	5.67	17.6366843
Dec-00	5.52	18.11594203
Jan-01	6.57	15.22070015
Feb-01	6.64	15.06024096
Mar-01	5.24	19.08396947
Apr-01	5.31	18.83239171
May-01	5.24	19.08396947
Jun-01	5.55	18.01801802
Jul-01	5.15	19.41747573
Aug-01	5.47	18.28153565
Sep-01	3.54	28.24858757
Oct-01	3.52	28.40909091
Nov-01	4.82	20.74688797
Dec-01	4.92	20.32520325
Jan-02	5.7	17.54385965
Feb-02	6.09	16.42036125
Mar-02	6.23	16.05136437
Apr-02	6.27	15.94896332
May-02	6.72	14.88095238
Jun-02	7.95	12.57861635
Jul-02	7.09	14.10437236
Aug-02	6.54	15.29051988
Sep-02	7.41	13.49527665
Oct-02	7.68	13.02083333
Nov-02	7.07	14.14427157
Dec-02	6.98	14.32664756

C: The calculation & data of the spread

The monthly spread is the difference between the SET earnings yield and the three-month government bond interest rate at each point (month end) in the period. That is, monthly spread = the SET earnings yield at t point − the three-month government bond interest rate at t point.

Month End	SET Earnings Yield	3-Month Government Bond Rate	Spread
Jan-98	11.18568233	15.16	-3.974317673
Feb-98	11.18568233	14.7	-3.514317673
Mar-98	7.513148009	13.81	-6.296851991
Apr-98	6.455777921	15.1	-8.644222079
May-98	7.898894155	16.11	-8.211105845
Jun-98	9.328358209	15.41	-6.081641791
Jul-98	9.523809524	13.1	-3.576190476
Aug-98	12.45330012	12.98	-0.526699875
Sep-98	10.49317943	7.99	2.503179433
Oct-98	9.633911368	7.07	2.563911368
Nov-98	10.24590164	6.29	3.955901639
Dec-98	9.960159363	5.25	4.710159363
Jan-99	9.852216749	4.51	5.342216749
Feb-99	22.77904328	4.11	18.66904328
Mar-99	26.66666667	3.67	22.99666667
Apr-99	21.55172414	3.51	18.04172414
May-99	7.380073801	3.17	4.210073801
Jun-99	6.51465798	2.83	3.68465798
Jul-99	6.83994528	2.76	4.07994528
Aug-99	10.07049345	2.94	7.130493454
Sep-99	11.54734411	2.94	8.607344111
Oct-99	11.54734411	2.938	8.609344111
Nov-99	9.191176471	2.938	6.253176471

Dec-99	6.802721088	2.938	3.864721088
Jan-00	6.968641115	2.9375	4.031141115
Feb-00	8.613264427	2.89145	5.721814427
Mar-00	11.03752759	2.88043	8.157097594
Apr-00	11.45475372	2.72059	8.734163723
May-00	13.56852103	2.53947	11.02905103
Jun-00	14.16430595	2.45	11.71430595
Jul-00	14.90312966	2.4375	12.46562966
Aug-00	13.31557923	2.4375	10.87807923
Sep-00	15.92356688	2.4375	13.48606688
Oct-00	16.3132137	2.4375	13.8757137
Nov-00	17.6366843	2.4375	15.1991843
Dec-00	18.11594203	2.4375	15.67844203
Jan-01	15.22070015	2.41811	12.80259015
Feb-01	15.06024096	2.17619	12.88405096
Mar-01	19.08396947	1.82023	17.26373947
Apr-01	18.83239171	1.79567	17.03672171
May-01	19.08396947	1.82505	17.25891947
Jun-01	18.01801802	2.60614	15.41187802
Jul-01	19.41747573	2.7281	16.68937573
Aug-01	18.28153565	2.73409	15.54744565
Sep-01	28.24858757	2.779	25.46958757
Oct-01	28.40909091	2.645	25.76409091
Nov-01	20.74688797	2.49409	18.25279797
Dec-01	20.32520325	2.34944	17.97576325
Jan-02	17.54385965	2.06136	15.48249965
Feb-02	16.42036125	2.02947	14.39089125
Mar-02	16.05136437	2.06571	13.98565437
Apr-02	15.94896332	2.02684	13.92212332
May-02	14.88095238	1.9625	12.91845238
Jun-02	12.57861635	1.981	10.59761635
Jul-02	14.10437236	1.92857	12.17580236
Aug-02	15.29051988	1.85048	13.44003988
Sep-02	13.49527665	1.87238	11.62289665
Oct-02	13.02083333	1.89	11.13083333
Nov-02	14.14427157	1.73286	12.41141157
Dec-02	14.32664756	1.71056	12.61608756

D: The calculation & data of the return on the SET index

        The monthly return on the SET index is computed as the percentage change of the SET index in one month. That is, monthly return on the SET index = (SET index at t point – SET index at t-1 point) / SET index at t-1 point. Moreover, only 48 months (from January 1999 to December 2002) data of the return on the SET index are needed in the study because 1-12-month spreads will be used in the stepwise regression to select the important lags in the study.

Month End	SET Index	Return on the SET Index
Dec-98	355.81	/
Jan-99	363	2.020741407
Feb-99	340.94	-6.077134986
Mar-99	352.01	3.246905614
Apr-99	459.35	30.49345189
May-99	453.6	-1.251768804
Jun-99	521.77	15.02865961
Jul-99	456.81	-12.44993005
Aug-99	440.27	-3.620761367
Sep-99	389.49	-11.53383151
Oct-99	395.55	1.555880767
Nov-99	422.12	6.717229175
Dec-99	481.92	14.1665877
Jan-00	477.57	-0.902639442
Feb-00	374.32	-21.61986724
Mar-00	400.32	6.945928617
Apr-00	390.4	-2.478017586
May-00	323.29	-17.19006148
Jun-00	325.69	0.742367534
Jul-00	284.67	-12.59479873
Aug-00	307.83	8.135736116
Sep-00	227.29	-26.1637917

Oct-00	271.84	19.60051036
Nov-00	277.92	2.23660977
Dec-00	269.19	-3.14119171
Jan-01	332.77	23.61900516
Feb-01	325.2	-2.274844487
Mar-01	291.94	-10.22755228
Apr-01	300.63	2.976639035
May-01	310.13	3.160030602
Jun-01	322.55	4.004772192
Jul-01	297.69	-7.707332197
Aug-01	335.57	12.72464644
Sep-01	277.04	-17.44196442
Oct-01	275.09	-0.703869477
Nov-01	302.62	10.00763387
Dec-01	303.85	0.406450334
Jan-02	340.82	12.16718776
Feb-02	371.81	9.092776246
Mar-02	373.95	0.575562787
Apr-02	371.42	-0.676561038
May-02	407.96	9.837919337
Jun-02	389.1	-4.623002255
Jul-02	376.02	-3.361603701
Aug-02	361.16	-3.951917451
Sep-02	331.79	-8.132129804
Oct-02	357.22	7.664486573
Nov-02	364.9	2.149935614
Dec-02	356.48	-2.307481502

E: The data for the independent variables selection

In the study, based on the theoretical frame, the stepwise regression is used to select the important lags of the spread. And the 12-month lag of the spread is selected as the upper limit lag. Therefore, the 48 months returns on the SET index and their respective corresponding 1-12-month lags of the spread are matched together and shown below.

Month End	Return on the SET Index	1-Month Lag of the Spread	2-Month Lag of the Spread	3-Month Lag of the Spread
Jan-99	2.020741407	4.710159363	3.955901639	2.563911368
Feb-99	-6.077134986	5.342216749	4.710159363	3.955901639
Mar-99	3.246905614	18.66904328	5.342216749	4.710159363
Apr-99	30.49345189	22.99666667	18.66904328	5.342216749
May-99	-1.251768804	18.04172414	22.99666667	18.66904328
Jun-99	15.02865961	4.210073801	18.04172414	22.99666667
Jul-99	-12.44993005	3.68465798	4.210073801	18.04172414
Aug-99	-3.620761367	4.07994528	3.68465798	4.210073801
Sep-99	-11.53383151	7.130493454	4.07994528	3.68465798
Oct-99	1.555880767	8.607344111	7.130493454	4.07994528
Nov-99	6.717229175	8.609344111	8.607344111	7.130493454
Dec-99	14.1665877	6.253176471	8.609344111	8.607344111
Jan-00	-0.902639442	3.864721088	6.253176471	8.609344111
Feb-00	-21.61986724	4.031141115	3.864721088	6.253176471
Mar-00	6.945928617	5.721814427	4.031141115	3.864721088
Apr-00	-2.478017586	8.157097594	5.721814427	4.031141115
May-00	-17.19006148	8.734163723	8.157097594	5.721814427
Jun-00	0.742367534	11.02905103	8.734163723	8.157097594
Jul-00	-12.59479873	11.71430595	11.02905103	8.734163723
Aug-00	8.135736116	12.46562966	11.71430595	11.02905103
Sep-00	-26.1637917	10.87807923	12.46562966	11.71430595
Oct-00	19.60051036	13.48606688	10.87807923	12.46562966

Nov-00	2.23660977	13.8757137	13.48606688	10.87807923
Dec-00	-3.14119171	15.1991843	13.8757137	13.48606688
Jan-01	23.61900516	15.67844203	15.1991843	13.8757137
Feb-01	-2.274844487	12.80259015	15.67844203	15.1991843
Mar-01	-10.22755228	12.88405096	12.80259015	15.67844203
Apr-01	2.976639035	17.26373947	12.88405096	12.80259015
May-01	3.160030602	17.03672171	17.26373947	12.88405096
Jun-01	4.004772192	17.25891947	17.03672171	17.26373947
Jul-01	-7.707332197	15.41187802	17.25891947	17.03672171
Aug-01	12.72464644	16.68937573	15.41187802	17.25891947
Sep-01	-17.44196442	15.54744565	16.68937573	15.41187802
Oct-01	-0.703869477	25.46958757	15.54744565	16.68937573
Nov-01	10.00763387	25.76409091	25.46958757	15.54744565
Dec-01	0.406450334	18.25279797	25.76409091	25.46958757
Jan-02	12.16718776	17.97576325	18.25279797	25.76409091
Feb-02	9.092776246	15.48249965	17.97576325	18.25279797
Mar-02	0.575562787	14.39089125	15.48249965	17.97576325
Apr-02	-0.676561038	13.98565437	14.39089125	15.48249965
May-02	9.837919337	13.92212332	13.98565437	14.39089125
Jun-02	-4.623002255	12.91845238	13.92212332	13.98565437
Jul-02	-3.361603701	10.59761635	12.91845238	13.92212332
Aug-02	-3.951917451	12.17580236	10.59761635	12.91845238
Sep-02	-8.132129804	13.44003988	12.17580236	10.59761635
Oct-02	7.664486573	11.62289665	13.44003988	12.17580236
Nov-02	2.149935614	11.13083333	11.62289665	13.44003988
Dec-02	-2.307481502	12.41141157	11.13083333	11.62289665

Month End	Return on the SET Index	4-Month Lag of the Spread	5-Month Lag of the Spread	6-Month Lag of the Spread
Jan-99	2.020741407	2.503179433	-0.526699875	-3.576190476
Feb-99	-6.077134986	2.563911368	2.503179433	-0.526699875
Mar-99	3.246905614	3.955901639	2.563911368	2.503179433
Apr-99	30.49345189	4.710159363	3.955901639	2.563911368
May-99	-1.251768804	5.342216749	4.710159363	3.955901639
Jun-99	15.02865961	18.66904328	5.342216749	4.710159363
Jul-99	-12.44993005	22.99666667	18.66904328	5.342216749
Aug-99	-3.620761367	18.04172414	22.99666667	18.66904328
Sep-99	-11.53383151	4.210073801	18.04172414	22.99666667
Oct-99	1.555880767	3.68465798	4.210073801	18.04172414
Nov-99	6.717229175	4.07994528	3.68465798	4.210073801
Dec-99	14.1665877	7.130493454	4.07994528	3.68465798
Jan-00	-0.902639442	8.607344111	7.130493454	4.07994528
Feb-00	-21.61986724	8.609344111	8.607344111	7.130493454
Mar-00	6.945928617	6.253176471	8.609344111	8.607344111
Apr-00	-2.478017586	3.864721088	6.253176471	8.609344111
May-00	-17.19006148	4.031141115	3.864721088	6.253176471
Jun-00	0.742367534	5.721814427	4.031141115	3.864721088
Jul-00	-12.59479873	8.157097594	5.721814427	4.031141115
Aug-00	8.135736116	8.734163723	8.157097594	5.721814427
Sep-00	-26.1637917	11.02905103	8.734163723	8.157097594
Oct-00	19.60051036	11.71430595	11.02905103	8.734163723
Nov-00	2.23660977	12.46562966	11.71430595	11.02905103
Dec-00	-3.14119171	10.87807923	12.46562966	11.71430595
Jan-01	23.61900516	13.48606688	10.87807923	12.46562966
Feb-01	-2.274844487	13.8757137	13.48606688	10.87807923
Mar-01	-10.22755228	15.1991843	13.8757137	13.48606688
Apr-01	2.976639035	15.67844203	15.1991843	13.8757137
May-01	3.160030602	12.80259015	15.67844203	15.1991843
Jun-01	4.004772192	12.88405096	12.80259015	15.67844203
Jul-01	-7.707332197	17.26373947	12.88405096	12.80259015
Aug-01	12.72464644	17.03672171	17.26373947	12.88405096
Sep-01	-17.44196442	17.25891947	17.03672171	17.26373947
Oct-01	-0.703869477	15.41187802	17.25891947	17.03672171
Nov-01	10.00763387	16.68937573	15.41187802	17.25891947
Dec-01	0.406450334	15.54744565	16.68937573	15.41187802
Jan-02	12.16718776	25.46958757	15.54744565	16.68937573
Feb-02	9.092776246	25.76409091	25.46958757	15.54744565
Mar-02	0.575562787	18.25279797	25.76409091	25.46958757

Apr-02	-0.676561038	17.97576325	18.25279797	25.76409091
May-02	9.837919337	15.48249965	17.97576325	18.25279797
Jun-02	-4.623002255	14.39089125	15.48249965	17.97576325
Jul-02	-3.361603701	13.98565437	14.39089125	15.48249965
Aug-02	-3.951917451	13.92212332	13.98565437	14.39089125
Sep-02	-8.132129804	12.91845238	13.92212332	13.98565437
Oct-02	7.664486573	10.59761635	12.91845238	13.92212332
Nov-02	2.149935614	12.17580236	10.59761635	12.91845238
Dec-02	-2.307481502	13.44003988	12.17580236	10.59761635

Month End	Return on the SET Index	7-Month Lag of the Spread	8-Month Lag of the Spread	9-Month Lag of the Spread
Jan-99	2.020741407	-6.081641791	-8.211105845	-8.644222079
Feb-99	-6.077134986	-3.576190476	-6.081641791	-8.211105845
Mar-99	3.246905614	-0.526699875	-3.576190476	-6.081641791
Apr-99	30.49345189	2.503179433	-0.526699875	-3.576190476
May-99	-1.251768804	2.563911368	2.503179433	-0.526699875
Jun-99	15.02865961	3.955901639	2.563911368	2.503179433
Jul-99	-12.44993005	4.710159363	3.955901639	2.563911368
Aug-99	-3.620761367	5.342216749	4.710159363	3.955901639
Sep-99	-11.53383151	18.66904328	5.342216749	4.710159363
Oct-99	1.555880767	22.99666667	18.66904328	5.342216749
Nov-99	6.717229175	18.04172414	22.99666667	18.66904328
Dec-99	14.1665877	4.210073801	18.04172414	22.99666667
Jan-00	-0.902639442	3.68465798	4.210073801	18.04172414
Feb-00	-21.61986724	4.07994528	3.68465798	4.210073801
Mar-00	6.945928617	7.130493454	4.07994528	3.68465798
Apr-00	-2.478017586	8.607344111	7.130493454	4.07994528
May-00	-17.19006148	8.609344111	8.607344111	7.130493454
Jun-00	0.742367534	6.253176471	8.609344111	8.607344111
Jul-00	-12.59479873	3.864721088	6.253176471	8.609344111
Aug-00	8.135736116	4.031141115	3.864721088	6.253176471
Sep-00	-26.1637917	5.721814427	4.031141115	3.864721088
Oct-00	19.60051036	8.157097594	5.721814427	4.031141115
Nov-00	2.23660977	8.734163723	8.157097594	5.721814427
Dec-00	-3.14119171	11.02905103	8.734163723	8.157097594
Jan-01	23.61900516	11.71430595	11.02905103	8.734163723
Feb-01	-2.274844487	12.46562966	11.71430595	11.02905103
Mar-01	-10.22755228	10.87807923	12.46562966	11.71430595
Apr-01	2.976639035	13.48606688	10.87807923	12.46562966
May-01	3.160030602	13.8757137	13.48606688	10.87807923
Jun-01	4.004772192	15.1991843	13.8757137	13.48606688
Jul-01	-7.707332197	15.67844203	15.1991843	13.8757137
Aug-01	12.72464644	12.80259015	15.67844203	15.1991843
Sep-01	-17.44196442	12.88405096	12.80259015	15.67844203
Oct-01	-0.703869477	17.26373947	12.88405096	12.80259015
Nov-01	10.00763387	17.03672171	17.26373947	12.88405096
Dec-01	0.406450334	17.25891947	17.03672171	17.26373947
Jan-02	12.16718776	15.41187802	17.25891947	17.03672171
Feb-02	9.092776246	16.68937573	15.41187802	17.25891947
Mar-02	0.575562787	15.54744565	16.68937573	15.41187802

Apr-02	-0.676561038	25.46958757	15.54744565	16.68937573
May-02	9.837919337	25.76409091	25.46958757	15.54744565
Jun-02	-4.623002255	18.25279797	25.76409091	25.46958757
Jul-02	-3.361603701	17.97576325	18.25279797	25.76409091
Aug-02	-3.951917451	15.48249965	17.97576325	18.25279797
Sep-02	-8.132129804	14.39089125	15.48249965	17.97576325
Oct-02	7.664486573	13.98565437	14.39089125	15.48249965
Nov-02	2.149935614	13.92212332	13.98565437	14.39089125
Dec-02	-2.307481502	12.91845238	13.92212332	13.98565437

Month End	Return on the SET Index	10-Month Lag of the Spread	11-Month Lag of the Spread	12-Month Lag of the Spread
Jan-99	2.020741407	-6.296851991	-3.514317673	-3.974317673
Feb-99	-6.077134986	-8.644222079	-6.296851991	-3.514317673
Mar-99	3.246905614	-8.211105845	-8.644222079	-6.296851991
Apr-99	30.49345189	-6.081641791	-8.211105845	-8.644222079
May-99	-1.251768804	-3.576190476	-6.081641791	-8.211105845
Jun-99	15.02865961	-0.526699875	-3.576190476	-6.081641791
Jul-99	-12.44993005	2.503179433	-0.526699875	-3.576190476
Aug-99	-3.620761367	2.563911368	2.503179433	-0.526699875
Sep-99	-11.53383151	3.955901639	2.563911368	2.503179433
Oct-99	1.555880767	4.710159363	3.955901639	2.563911368
Nov-99	6.717229175	5.342216749	4.710159363	3.955901639
Dec-99	14.1665877	18.66904328	5.342216749	4.710159363
Jan-00	-0.902639442	22.99666667	18.66904328	5.342216749
Feb-00	-21.61986724	18.04172414	22.99666667	18.66904328
Mar-00	6.945928617	4.210073801	18.04172414	22.99666667
Apr-00	-2.478017586	3.68465798	4.210073801	18.04172414
May-00	-17.19006148	4.07994528	3.68465798	4.210073801
Jun-00	0.742367534	7.130493454	4.07994528	3.68465798
Jul-00	-12.59479873	8.607344111	7.130493454	4.07994528
Aug-00	8.135736116	8.609344111	8.607344111	7.130493454
Sep-00	-26.1637917	6.253176471	8.609344111	8.607344111
Oct-00	19.60051036	3.864721088	6.253176471	8.609344111
Nov-00	2.23660977	4.031141115	3.864721088	6.253176471
Dec-00	-3.14119171	5.721814427	4.031141115	3.864721088
Jan-01	23.61900516	8.157097594	5.721814427	4.031141115
Feb-01	-2.274844487	8.734163723	8.157097594	5.721814427
Mar-01	-10.22755228	11.02905103	8.734163723	8.157097594
Apr-01	2.976639035	11.71430595	11.02905103	8.734163723
May-01	3.160030602	12.46562966	11.71430595	11.02905103
Jun-01	4.004772192	10.87807923	12.46562966	11.71430595
Jul-01	-7.707332197	13.48606688	10.87807923	12.46562966
Aug-01	12.72464644	13.8757137	13.48606688	10.87807923
Sep-01	-17.44196442	15.1991843	13.8757137	13.48606688
Oct-01	-0.703869477	15.67844203	15.1991843	13.8757137
Nov-01	10.00763387	12.80259015	15.67844203	15.1991843
Dec-01	0.406450334	12.88405096	12.80259015	15.67844203
Jan-02	12.16718776	17.26373947	12.88405096	12.80259015
Feb-02	9.092776246	17.03672171	17.26373947	12.88405096
Mar-02	0.575562787	17.25891947	17.03672171	17.26373947

Apr-02	-0.676561038	15.41187802	17.25891947	17.03672171
May-02	9.837919337	16.68937573	15.41187802	17.25891947
Jun-02	-4.623002255	15.54744565	16.68937573	15.41187802
Jul-02	-3.361603701	25.46958757	15.54744565	16.68937573
Aug-02	-3.951917451	25.76409091	25.46958757	15.54744565
Sep-02	-8.132129804	18.25279797	25.76409091	25.46958757
Oct-02	7.664486573	17.97576325	18.25279797	25.76409091
Nov-02	2.149935614	15.48249965	17.97576325	18.25279797
Dec-02	-2.307481502	14.39089125	15.48249965	17.97576325

F: The data of the independent and dependent variable in the conceptual framework

As a result, only the 1-month lag of the spread is selected as the independent variable in the conceptual framework in the study. Thus, the 48 months data of the dependent variable-return on the SET index and the independent variable- 1 -month lag of the spread between the SET earnings yield and 3-month government bond interest rate in the conceptual framework are presented below.

Month End	Return on the SET Index	1-Month Lag of the Spread
Jan-99	2.020741407	4.710159363
Feb-99	-6.077134986	5.342216749
Mar-99	3.246905614	18.66904328
Apr-99	30.49345189	22.99666667
May-99	-1.251768804	18.04172414
Jun-99	15.02865961	4.210073801
Jul-99	-12.44993005	3.68465798
Aug-99	-3.620761367	4.07994528
Sep-99	-11.53383151	7.130493454
Oct-99	1.555880767	8.607344111
Nov-99	6.717229175	8.609344111
Dec-99	14.1665877	6.253176471
Jan-00	-0.902639442	3.864721088
Feb-00	-21.61986724	4.031141115
Mar-00	6.945928617	5.721814427
Apr-00	-2.478017586	8.157097594
May-00	-17.19006148	8.734163723
Jun-00	0.742367534	11.02905103
Jul-00	-12.59479873	11.71430595
Aug-00	8.135736116	12.46562966
Sep-00	-26.1637917	10.87807923
Oct-00	19.60051036	13.48606688

Nov-00	2.23660977	13.8757137
Dec-00	-3.14119171	15.1991843
Jan-01	2161900516	15.67844203
Feb-01	-2.274844487	12.80259015
Mar-01	-10.22755228	12.88405096
Apr-01	2.976639035	17.26373947
May-01	3.160030602	17.03672171
Jun-01	4.004772192	17.25891947
Jul-01	-7.707332197	15.41187802
Aug-01	12.72464644	16.68937573
Sep-01	-17.44196442	15.54744565
Oct-01	-0.703869477	25.46958757
Nov-01	10.00763387	25.76409091
Dec-01	0.406450334	18.25279797
Jan-02	12.16718776	17.97576325
Feb-02	9.092776246	15.48249965
Mar-02	0.575562787	14.39089125
Apr-02	-0.676561038	13.98565437
May-02	9.837919337	13.92212332
Jun-02	-4.623002255	12.91845238
Jul-02	-3.361603701	10.59761635
Aug-02	-3.951917451	12.17580236
Sep-02	-8.132129804	13.44003988
Oct-02	7.664486573	11.62289665
Nov-02	2.149935614	11.13083333
Dec-02	-2.307481502	12.41141157

G: All the other data used in the study

Except the data used in the frameworks, all the other data used in the study are also obtained from the CEIC database or through the simple calculations.

Month End	SET E/P	SET P/E	3-Month Fix Deposit Rate	Spread
Jan-81	15.40832	6.49	9	6.4083205
Feb-81	14.64129	6.83	9	5.6412884
Mar-81	13.88889	7.2	9	4.8888889
Apr-81	13.03781	7.67	9	4.0378096
May-81	13.2626	7.54	9	4.2625995
Jun-81	12.85347	7.78	9	3.8534704
Jul-81	13.0719	7.65	10	3.0718954
Aug-81	11.7096	8.54	10	1.7096019
Sep-81	11.60093	8.62	10	1.6009281
Oct-81	11.90476	8.4	10	1.9047619
Nov-81	10.61571	9.42	10	0.6157113
Dec-81	10.5042	9.52	10	0.5042017
Jan-82	10.88139	9.19	10	0.8813928
Feb-82	11.24859	8.89	10	1.2485939
Mar-82	10.97695	9.11	10	0.9769484
Apr-82	10.75269	9.3	10	0.7526882
May-82	10.1833	9.82	10	0.1832994
Jun-82	9.057971	11.04	10	-0.942029
Jul-82	9.478673	10.55	10	-0.521327
Aug-82	8.62069	11.6	10	-1.37931
Sep-82	8.291874	12.06	10	-1.708126
Oct-82	8.183306	12.22	10	-1.816694
Nov-82	8.718396	11.47	10	-1.281604
Dec-82	8.453085	11.83	10	-1.546915
Jan-83	7.861635	12.72	10	-2.138365
Feb-83	8.756567	11.42	10	-1.243433
Mar-83	7.698229	12.99	10	-2.301771
Apr-83	7.513148	13.31	10	-2.486852
May-83	8.70322	11.49	9.5	-0.79678
Jun-83	9.174312	10.9	9.5	-0.325688

Jul-83	8.688097	11.51	9.5	-0.811903
Aug-83	9.871668	10.13	9.5	0.3716683
Sep-83	10.12146	9.88	9.5	0.6214575
Oct-83	11.03753	9.06	9.5	1.5375276
Nov-83	11.6144	8.61	9.5	2.1144019
Dec-83	15.29052	6.54	10	5.2905199
Jan-84	15.2207	6.57	10	5.2207002
Feb-84	15.4321	6.48	10	5.4320988
Mar-84	13.86963	7.21	10	3.8696255
Apr-84	14.59854	6.85	10	4.5985401
May-84	14.08451	7.1	12.5	1.584507
Jun-84	16.80672	5.95	12.5	4.3067227
Jul-84	16.83502	5.94	12.5	4.3350168
Aug-84	15.77287	6.34	12.5	3.2728707
Sep-84	15.69859	6.37	12.5	3.1985871
Oct-84	16.83502	5.94	12.5	4.3350168
Nov-84	12.90323	7.75	12.5	0.4032258
Dec-84	13.90821	7.19	11	2.9082058
Jan-85	14.36782	6.96	12	2.3678161
Feb-85	13.98601	7.15	12	1.986014
Mar-85	13.0719	7.65	12	1.0718954
Apr-85	11.72333	8.53	12	-0.276671
May-85	11.49425	8.7	12	-0.505747
Jun-85	11.82033	8.46	11	0.820331
Jul-85	11.80638	8.47	12	-0.193625
Aug-85	11.82033	8.46	10.5	1.320331
Sep-85	11.48106	8.71	10.5	0.9810563
Oct-85	11.42857	8.75	10.5	0.9285714
Nov-85	10.72961	9.32	10.5	0.2296137
Dec-85	10.42753	9.59	10.5	-0.072471
Jan-86	10.15228	9.85	10.75	-0.597716
Feb-86	9.930487	10.07	10.75	-0.819513
Mar-86	10.46025	9.56	9	1.460251
Apr-86	10.9529	9.13	8.5	2.4529025
May-86	10.25641	9.75	8.5	1.7564103
Jun-86	10.05025	9.95	8.5	1.5502513
Jul-86	9.775171	10.23	7.5	2.2751711
Aug-86	9.033424	11.07	7.5	1.5334237
Sep-86	8.291874	12.06	6.75	1.541874
Oct-86	7.692308	13	6.75	0.9423077
Nov-86	8.496177	11.77	6.75	1.7461767

Dec-86	8.103728	12.34	6.75	1.3537277
Jan-87	7.581501	13.19	6.75	0.8315011
Feb-87	8.223684	12.16	6.75	1.4736842
Mar-87	7.880221	12.69	6.75	1.1302206
Apr-87	7.535795	13.27	6.75	0.785795
May-87	7.824726	12.78	6.75	1.0747261
Jun-87	7.107321	14.07	6.75	0.3573205
Jul-87	6.868132	14.56	6.75	0.1181319
Aug-87	6.671114	14.99	6.75	-0.078886
Sep-87	8.045052	12.43	6.75	1.2950523
Oct-87	8.045052	12.43	6.75	1.2950523
Nov-87	9.832842	10.17	6.75	3.0828417
Dec-87	10.74114	9.31	6.75	3.9911386
Jan-88	9.433962	10.6	6.75	2.6839623
Feb-88	8.190008	12.21	6.75	1.4400082
Mar-88	7.745933	12.91	6.75	0.9959334
Apr-88	7.535795	13.27	6.75	0.785795
May-88	7.407407	13.5	6.75	0.6574074
Jun-88	6.715917	14.89	6.75	-0.034083
Jul-88	6.680027	14.97	6.75	-0.069973
Aug-88	7.352941	13.6	6.75	0.6029412
Sep-88	7.132668	14.02	7.125	0.0076676
Oct-88	7.581501	13.19	7.125	0.4565011
Nov-88	8.097166	12.35	8.125	-0.027834
Dec-88	8.312552	12.03	8.125	0.187552
Jan-89	7.401925	13.51	9.25	-1.848075
Feb-89	6.997901	14.29	9.25	-2.252099
Mar-89	6.7659	14.78	9.25	-2.4841
Apr-89	5.966587	16.76	9.25	-3.283413
May-89	5.945303	16.82	9.5	-3.554697
Jun-89	5.02008	19.92	9.5	-4.47992
Jul-89	4.743833	21.08	9.5	-4.756167
Aug-89	4.315926	23.17	9.5	-5.184074
Sep-89	4.275331	23.39	9.5	-5.224669
Oct-89	4.599816	21.74	9.5	-4.900184
Nov-89	4.636069	21.57	9.5	-4.863931
Dec-89	3.789314	26.39	9.5	-5.710686
Jan-90	3.766478	26.55	9.5	-5.733522
Feb-90	4.081633	24.5	9.5	-5.418367
Mar-90	4.111842	24.32	11.25	-7.138158
Apr-90	3.998401	25.01	11.5	-7.501599

May-90	3.436426	29.1	11.5	-8.063574
Jun-90	3.471017	28.81	11.5	-8.028983
Jul-90	3.55366	28.14	12	-8.44634
Aug-90	5.002501	19.99	12.5	-7.497499
Sep-90	6.418485	15.58	13	-6.581515
Oct-90	6.6357	15.07	13.25	-6.6143
Nov-90	7.293946	13.71	13.75	-6.456054
Dec-90	7.24113	13.81	14.25	-7.00887
Jan-91	6.915629	14.46	14.25	-7.334371
Feb-91	5.959476	16.78	14.5	-8.540524
Mar-91	5.13347	19.48	14.25	-9.11653
Apr-91	5.24109	19.08	13.375	-8.13391
May-91	5.730659	17.45	13.375	-7.644341
Jun-91	6.071645	16.47	13.875	-7.803355
Jul-91	6.896552	14.5	14.125	-7.228448
Aug-91	7.052186	14.18	14.375	-7.322814
Sep-91	7.309942	13.68	12.5	-5.190058
Oct-91	7.440476	13.44	11	-3.559524
Nov-91	6.752194	14.81	11	-4.247806
Dec-91	6.414368	15.59	11	-4.585632
Jan-92	6.277464	15.93	10	-3.722536
Feb-92	6.313131	15.84	9.75	-3.436869
Mar-92	5.955926	16.79	8.75	-2.794074
Apr-92	6.246096	16.01	7.5	-1.253904
May-92	6.925208	14.44	7.5	-0.574792
Jun-92	6.257822	15.98	8	-1.742178
Jul-92	6.675567	14.98	8.5	-1.824433
Aug-92	6.640106	15.06	8.5	-1.859894
Sep-92	5.955926	16.79	8.5	-2.544074
Oct-92	5.724098	17.47	8.5	-2.775902
Nov-92	6.246096	16.01	8.25	-2.003904
Dec-92	6.138735	16.29	8.5	-2.361265
Jan-93	6.086427	16.43	8.5	-2.413573
Feb-93	6.393862	15.64	8.5	-2.106138
Mar-93	6.65336	15.03	8.5	-1.84664
Apr-93	6.968641	14.35	8.5	-1.531359
May-93	6.906077	14.48	8.5	-1.593923
Jun-93	6.666667	15	8.5	-1.833333
Jul-93	6.464124	15.47	8.5	-2.035876
Aug-93	6.101281	16.39	7.5	-1.398719
Sep-93	6.116208	16.35	7.5	-1.383792

Oct-93	4.928536	20.29	7.25	-2.321464
Nov-93	4.750594	21.05	7.25	-2.499406
Dec-93	3.832886	26.09	6.75	-2.917114
Jan-94	3.741115	26.73	6.375	-2.633885
Feb-94	4.286327	23.33	6.375	-2.088673
Mar-94	4.366812	22.9	6.875	-2.508188
Apr-94	4.262575	23.46	7	-2.737425
May-94	4.315926	23.17	7.75	-3.434074
Jun-94	4.582951	21.82	8	-3.417049
Jul-94	4.2123	23.74	8.625	-4.4127
Aug-94	4.009623	24.94	8.875	-4.865377
Sep-94	4.116921	24.29	8.875	-4.758079
Oct-94	4.017678	24.89	9.25	-5.232322
Nov-94	4.861449	20.57	9.375	-4.513551
Dec-94	5.125577	19.51	9.375	-4.249423
Jan-95	5.773672	17.32	9.375	-3.601328
Feb-95	5.310674	18.83	9.875	-4.564326
Mar-95	5.22466	19.14	10.75	-5.52534
Apr-95	5.227392	19.13	11.125	-5.897608
May-95	4.568296	21.89	11.125	-6.556704
Jun-95	4.48833	22.28	11.125	-6.63667
Jul-95	4.533092	22.06	11.125	-6.591908
Aug-95	4.882813	20.48	11.125	-6.242188
Sep-95	5.017561	19.93	11	-5.982439
Oct-95	5.102041	19.6	11.5	-6.397959
Nov-95	5.431831	18.41	11.5	-6.068169
Dec-95	5.063291	19.75	11.5	-6.436709
Jan-96	4.618938	21.65	11.25	-6.631062
Feb-96	4.933399	20.27	10.875	-5.941601
Mar-96	5.104645	19.59	10.75	-5.645355
Apr-96	5.08647	19.66	10.5	-5.41353
May-96	5.167959	19.35	10.125	-4.957041
Jun-96	5.428882	18.42	9.875	-4.446118
Jul-96	6.257822	15.98	9.5	-3.242178
Aug-96	5.98444	16.71	9.5	-3.51556
Sep-96	6.02047	16.61	9.5	-3.47953
Oct-96	7.230658	13.83	9.5	-2.269342
Nov-96	7.501875	13.33	9.5	-1.998125
Dec-96	8.354219	11.97	9.25	-0.895781
Jan-97	8.802817	11.36	9.25	-0.447183
Feb-97	9.52381	10.5	9.25	0.2738095

Mar-97	9.442871	10.59	9.25	0.1928706
Apr-97	9.90099	10.1	9	0.9009901
May-97	10.89325	9.18	8.75	2.1432462
Jun-97	11.66861	8.57	8.75	2.9186114
Jul-97	9.057971	11.04	10.75	-1.692029
Aug-97	11.91895	8.39	10.75	1.1689511
Sep-97	10.26694	9.74	10.75	-0.48306
Oct-97	12.31527	8.12	10.75	1.5652709
Nov-97	14.72754	6.79	10.75	3.9775405
Dec-97	15.17451	6.59	10.75	4.4245068
Jan-98	11.185682	8.94	10.75	0.4356823
Feb-98	11.185682	8.94	11.125	0.0606823
Mar-98	7.513148	13.31	11.125	-3.611852
Apr-98	6.455778	15.49	11.125	-4.669222
May-98	7.898894	12.66	11.125	-3.226106
Jun-98	9.328358	10.72	11	-1.671642
Jul-98	9.523810	10.5	12	-2.47619
Aug-98	12.453302	8.03	11	1.4533001
Sep-98	10.493179	9.53	8	2.4931794
Oct-98	9.633911	10.38	7.25	2.3839114
Nov-98	10.245902	9.76	6.375	3.8709016
Dec-98	9.960159	10.04	6	3.9601594
Jan-99	9.852217	10.15	5.75	4.1022167
Feb-99	22.779043	4.39	5.125	17.654043
Mar-99	26.666667	3.75	5	21.666667
Apr-99	21.551724	4.64	5	16.551724
May-99	7.380074	13.55	5	2.3800738
Jun-99	6.514658	15.35	4.75	1.764658
Jul-99	6.839945	14.62	4.75	2.0899453
Aug-99	10.070493	9.93	4.5	5.5704935
Sep-99	11.547344	8.66	4.375	7.1723441
Oct-99	11.547344	8.66	4.125	7.4223441
Nov-99	9.191176	10.88	4	5.1911765
Dec-99	6.802721	14.7	3.75	3.0527211
Jan-00	6.968641	14.35	3.5	3.4686411
Feb-00	8.613264	11.61	3.5	5.1132644
Mar-00	11.037528	9.06	3.5	7.5375276
Apr-00	11.454753	8.73	3.5	7.9547537
May-00	13.568521	7.37	3.5	10.068521
Jun-00	14.164306	7.06	3.5	10.664306
Jul-00	14.90313	6.71	3.25	11.65313

Aug-00	13.315580	7.51	3.25	10.065579
Sep-00	15.923567	6.28	3	12.923567
Oct-00	16.313213	6.13	3	13.313214
Nov-00	17.636684	5.67	3	14.636684
Dec-00	18.115942	5.52	3	15.115942
Jan-01	15.2207	6.57	3	12.2207
Feb-01	15.06024	6.64	2.5	12.560241
Mar-01	19.083969	5.24	2.5	16.583969
Apr-01	18.832391	5.31	2.5	16.332392
May-01	19.083969	5.24	2.5	16.583969
Jun-01	18.018018	5.55	2.5	15.518018
Jul-01	19.417476	5.15	2.5	16.917476
Aug-01	18.281536	5.47	2.5	15.781536
Sep-01	28.248588	3.54	2.5	25.748588
Oct-01	28.409091	3.52	2.5	25.909091
Nov-01	20.746888	4.82	2.5	18.246888
Dec-01	20.325203	4.92	2.25	18.075203
Jan-02	17.54386	5.7	2.25	15.29386
Feb-02	16.420361	6.09	2	14.420361
Mar-02	16.051364	6.23	2	14.051364
Apr-02	15.948963	6.27	2	13.948963
May-02	14.880952	6.72	2	12.880952
Jun-02	12.578616	7.95	2	10.578616
Jul-02	14.104372	7.09	2	12.104372
Aug-02	15.29052	6.54	2	13.29052
Sep-02	13.495277	7.41	2	11.495277
Oct-02	13.020833	7.68	1.75	11.270833
Nov-02	14.144272	7.07	1.75	12.394272
Dec-02	14.326648	6.98	1.75	12.576648

Month End	S&P P/E	S&P E/P	3-Month T-bill Rate (U.S.)	Spread
Jan-98	24.05	4.158004	5.04	-0.882
Feb-98	25.09	3.985652	5.09	-1.10435
Mar-98	27.71	3.608805	5.03	-1.42119
Apr-98	27.56	3.628447	4.95	-1.32155
May-98	27.62	3.620565	5	-1.37944
Jun-98	28.65	3.490401	4.98	-1.4896
Jul-98	28.46	3.513703	4.96	-1.4463
Aug-98	27.42	3.646973	4.9	-1.25303
Sep-98	26.1	3.831418	4.61	-0.77858
Oct-98	27.41	3.648304	3.96	-0.3117
Nov-98	31.15	3.210273	4.41	-1.19973
Dec-98	32.34	3.092146	4.39	-1.29785
Jan-99	32.64	3.063725	4.34	-1.27627
Feb-99	32.91	3.03859	4.44	-1.40141
Mar-99	34.11	2.931692	4.44	-1.50831
Apr-99	35.82	2.791736	4.29	-1.49826
May-99	34.6	2.890173	4.5	-1.60983
Jun-99	35.77	2.795639	4.57	-1.77436
Jul-99	35.58	2.810568	4.55	-1.73943
Aug-99	36	2.777778	4.72	-1.94222
Sep-99	30.92	3.234153	4.68	-1.44585
Oct-99	31.61	3.163556	4.86	-1.69644
Nov-99	32.24	3.101737	5.07	-1.96826
Dec-99	33.29	3.003905	5.2	-2.19609
Jan-00	31.94	3.13087	5.32	-2.18913
Feb-00	30.95	3.231018	5.55	-2.31898
Mar-00	31.09	3.216468	5.69	-2.47353
Apr-00	30.33	3.297066	5.66	-2.36293
May-00	27.87	3.588088	5.79	-2.20191
Jun-00	30.35	3.294893	5.69	-2.39511
Jul-00	28.51	3.507541	5.96	-2.45246
Aug-00	28.7	3.484321	6.09	-2.60568
Sep-00	27.25	3.669725	6	-2.33028
Oct-00	26.29	3.803728	6.11	-2.30627
Nov-00	24.69	4.050223	6.17	-2.11978
Dec-00	24.73	4.043672	5.77	-1.72633
Jan-01	25.44	3.930818	5.15	-1.21918
Feb-01	24.38	4.101723	4.88	-0.77828

Mar-01	22.68	4.409171	4.42	-0.01083
Apr-01	24.18	4.135649	3.87	0.265649
May-01	27.31	3.661662	3.62	0.041662
Jun-01	26.5	3.773585	3.49	0.283585
Jul-01	26.2	3.816794	3.51	0.306794
Aug-01	25.28	3.955696	3.36	0.595696
Sep-01	27.33	3.658983	2.64	1.018983
Oct-01	28.81	3.471017	2.16	1.311017
Nov-01	30.67	3.260515	1.87	1.390515
Dec-01	40.33	2.479544	1.69	0.789544
Jan-02	39.33	2.542588	1.65	0.892588
Feb-02	39.2	2.55102	1.73	0.82102
Mar-02	40.43	2.473411	1.83	0.643411
Apr-02	44.27	2.258866	1.72	0.538866
May-02	43.24	2.312673	1.73	0.582673
Jun-02	39.41	2.537427	1.7	0.837427
Jul-02	36.91	2.709293	1.68	1.029293
Aug-02	37.16	2.691066	1.62	1.071066
Sep-02	31.41	3.183699	1.63	1.553699
Oct-02	33.31	3.002101	1.58	1.422101
Nov-02	35.11	2.848191	1.23	1.618191
Dec-02	29.42	3.399048	1.19	2.209048

Appendix II: SPSS Output

Equation (3.2)

Descriptive Statistics

	Mean	Std. Deviation	N
return	.60095003	11.02051935	48
spread1	12.53344100	5.43836511	48

Correlations

		return	spread1
Pearson Correlation	return	1.000	.326
	spread1	.326	1.000
Sig. (1-tailed)	return	.	.012
	spread1	.012	.
N	return	48	48
	spread1	48	48

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.326[a]	.106	.087	10.52988

a Predictors: (Constant), spread1

b Dependent Variable: return

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	607.833	1	607.833	5.482	.024[a]
	Residual	5100.404	46	110.878		
	Total	5708.237	47			

a Predictors: (Constant), spread1

b Dependent Variable: return

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-7.687	3.852		-1.995	.052
	spread1	.661	.282	.326	2.341	.024

a Dependent Variable: return

Residuals Statistics

|	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-5.25043	9.34990120	.60095003	3.59619445	48
Residual	-25.6701	22.97354889	1.78E-15	10.41725647	48
Std. Predicted Value	-1.627	2.433	.000	1.000	48
Std. Residual	-2.438	2.182	.000	.989	48

a Dependent Variable: return

Normal P-P Plot of Regression Standardized Residual

Dependent Variable: return
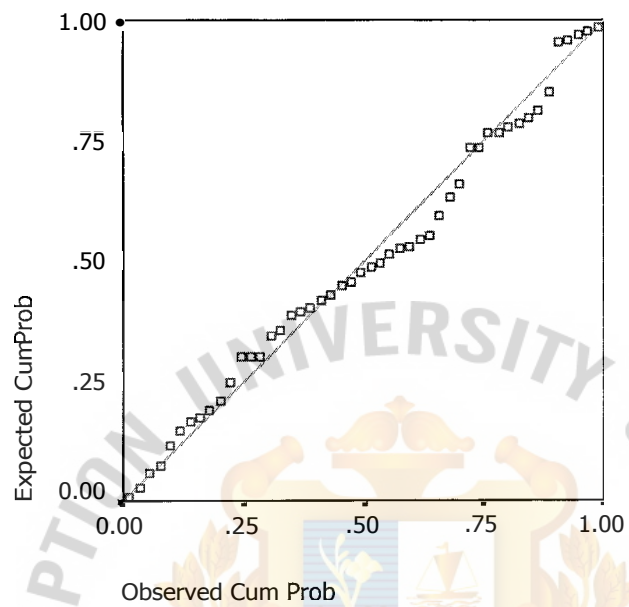
Scatterplot

Dependent Variable: return
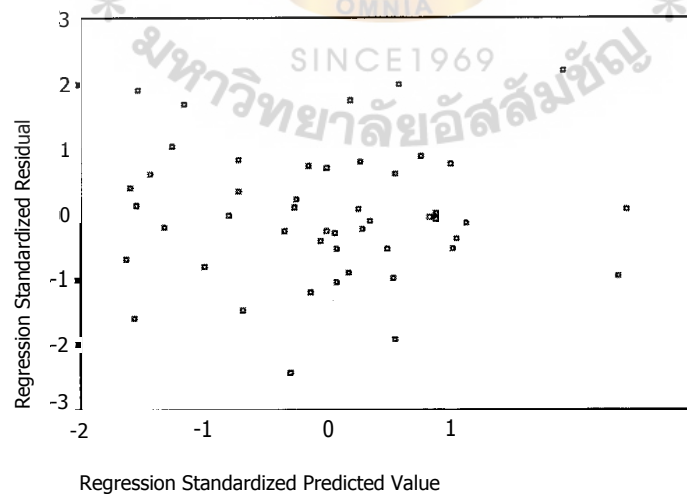
Stepwise regression (equation 3.1)

Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	spread 1		Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a Dependent Variable: return

Excluded Variables

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	spread2	.155[a]	.714	.479	.106	.416
	spread3	-.008[a]	-.049	.961	-.007	.790
	spread4	-.031[a]	-.213	.832	-.032	.918
	spread5	-.177[a]	-1.223	.228	-.179	.917
	spread6	-.195[a]	-1.326	.192	-.194	.886
	spread7	-.088[a]	-.585	.562	-.087	.869
	spread8	-.005[a]	-.036	.971	-.005	.909
	spread9	-.054[a]	-.377	.708	-.056	.963
	spread10	-.150[a]	-1.069	.291	-.157	.984
	spread11	-.212[a]	-1.533	.132	-.223	.986
	spread12	-.186[a]	-1.334	.189	-.195	.978

a Predictors in the Model: (Constant), spread1
b Dependent Variable: return