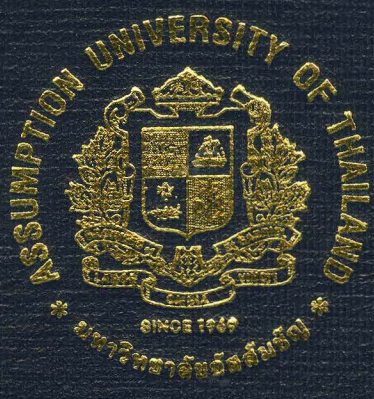

Comparison between SET Index and SET Property Development Index Based on Macro-Economic Factors in Thailand During 2002-11

Mr. Aissara Chokesirikulchai

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Business Administration in Finance
Graduate School of Business
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By	Mr. Aissara Chokesirikulchai
Major	Finance
Thesis Advisor	Assistant Professor Chittipa Ngamkroeckjoti, Ph.D.
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The Graduate School of Business, Assumption University, has approved this thesis as a partial fulfillment of the requirements for the Degree of Master of Business Administration in Finance.

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Abstract

This study seeks to examine the impacts of three macroeconomic variables (Exchange rate, interest rate and inflation rate) on both indices over the period from January 2002 to December 2011. Linear regression and Multiple regressions were adopted. In addition, this study uses Paired t-test to find the relationships between SETI and SETPDI.

This research emphasized both Indices (SETI and SETPDI), given that both indices are sensitive to Macroeconomic factors. The impact of exchange rate, interest rate and inflation rate to Thai stock market and property stock market were identified. In addition, the relationship between Thai stock market and property stock market was also confirmed.

The findings provide practical implications for Academies who would like to research further on this field of study. This study might be useful as a guide for academicians who are interested in doing further studies on Thai stock market. Future researches can be conducted on other industries or sectors in the SET and it is also suggested to include other factors such as GDP, gold price, oil price, unemployment rate and related factors.

The results have also implications on both local and foreign investors, stock market regulators such as Securities and Exchange Commission, policy makers and stock market analysts. For both local and foreign investors and stock analysts, they could predict the direction of stock market and earn profits. As for stock market regulators, they could take steps to monitor the activities of companies to prevent manipulation of stock prices and get the general public educated on the stock market and encourage them to invest in stocks. Finally, policy makers should be more aware of these Macroeconomic effects on stock market so that they could make their decisions more effectively and accurately.

Acknowledgement

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Finally, special thanks should be given to my family for their sincere love, understanding, support and encouragement for me to study my master's degree.

Aissara Chokesirikulchai

September, 2013

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CHAPTER 1

GENERALITIES OF THE STUDY

There are eight sections involved in this chapter. The first section introduces the study. The second section discusses the statement of the problem. The third section describes three research objectives. The fourth section confirms the scope of this research as well as provides five charts of variables used in this study. The fifth section explains the limitation of the study while the sixth section presents the significance of the study. The seventh section presents the terminology definitions of terms. Finally, the last section introduces the abbreviations included in this study.

1.1 Introduction

The Stock Exchange of Thailand (SET) was established by act of stock exchange of Thailand legislation in 1974. SET first traded officially on April 30th, 1975 as a secondary market for supporting trading asset documents of a company and assembling the asset from the public investors. The stock market in Thailand has been growing rapidly ever since. Over the years, SET has been through many times of crises. For example, in 1997 SET was in economic crisis as generally known as "Tom Yum Kung Crisis" whose main problem stemmed from the interest rate and exchange rate international system. For example, a great number of companies faced the problem of difficulty in paying back loan from foreign countries, the non-performing loan in banking system and related issues. The crisis resulted in the appreciation in foreign exchange rate of Thai Baht. Therefore, the Bank of Thailand decided to float Thai Baht cutting its peg to United States (US) Dollar. Consequently, the crisis led to purchasing of shares by foreign investors overwhelmly. Meanwhile in 2008, however, there was the "Hamburger Crisis", a critical situation arising from non-performing loan which immediately affects the stock of Thailand exchange. When foreign investors faced the problem mentioned above, foreign investors then began to sell out the shares in Thailand for bringing money back to support the liquidity of their own companies. From the study of these cases, the researcher found that the SET returns are sensitive to economical factors. Therefore, in this study, the researcher uses SET index (SETI) as the first representative as SET index is a composite index which represent the price movement for all common stocks trading on the SET (SET website, 2012) and aims to examine the potential impact that Macroeconomic factors have on SETI.

Based on the statement of Bank of Thailand, real estate sector is highly important to the Thai economy as real estate sector extends beyond its shares to GDP and employment of 8 percent and 7 percent, respectively. Furthermore, loans extended to the real estate sector also account for 15 percent of total commercial bank loans, of which a higher portion goes to residential mortgages, whereas, a lower portion goes to property developers. According to Brown and Matysiak (2000), more than 50 percent of the world's total assets are invested in direct real estate and securitized real estate investment vehicles such as real estate investment trusts (REITs) or real estate stocks. It can be clearly seen that investors in real estate can choose to invest directly in physical property or invest indirectly through the purchase of shares in real estate companies. In Thailand, the stocks of these companies are generally known as property stocks. In addition to the SET index, which is calculated from the prices of all common stocks on the main board, the SET also provides industry group and sectoral indices. Both these types of indices are calculated from the prices of the common stock which share the same basics which characterize each particular industry group and sector. However, in this study, the research emphasizes on property development sector which belongs to the property and construction industry. Therefore, the second representative is the SET property development index (SETPDI). Bloomberg describes SET Property Development Index (http://www.bloomberg.com/quote/SETPROP:IND) as a capitalization-weighted index of all stocks of the SET Index that are involved in the property sector except the property fund securities. Based on the statement of Kim *et al*. (2006) that since property stock combines the investment characteristics of direct real estate and general stock, property stock market return are likely to be different from those of stock markets, especially, in the long term. Therefore, this study will also cover Thai property stock market and investigate the potential impact that Macroeconomic factors have on SETPDI.

According to Joseph and Vezos (2006), Macroeconomics factors, such as exchange rate, interest rate, and inflation rate are important financial and economic factors that affect the value of common stock. Similarly, several studies in Singapore like Kim and Huang (2006) and Kim *et al.* (2006), have observed that return of direct real estate, REITs and property companies are influenced by Macroeconomic factors movements. Previous studies such as Joseph and Vezos (2006), Hyde (2007), Adjasi *et al.* (2011) and Chen and Chen (2012) have provided compatible evidence that the stock markets are sensitive to exchange rate movements as well as relevant in the price of common stocks. Moreover, Interest rate is

an important Macroeconomic factor that influences both stock market and real estate market. Prior studies such as Joseph and Vezos (2006), Kim and Huang (2006), Adjasi (2009), Hussainey and Ngoc (2009) and Majid and Yusof (2009) have also provided consistent evidence that the stock markets are sensitive to interest rate movements. One interesting point is there are several studies such as Kim and Shukla (2006), Anthony and Kwame (2008) and Pal and Mittal (2011) that explain the negative relationships between stock markets and inflation in different countries. However, there are a few studies that examine the relationships between inflation and Thai stock market.

This study uses Linear Regression and Multiple Regression model to determine the impacts of three Macroeconomic factors: Exchange rate (EX), Interest rate (PR) and Inflation rate (CCPI) on both indices (SETI and SETPDI) and. In addition, this study uses Paired t-test to find the relationships between SETI and SETPDI. More elaborately, this study seeks to examine the impacts of three Macroeconomic factors on both indices over the period from January 2002 to December 2011.

1.2 Statement of the Problem

Since SET was established in 1974, it has been through many times of crises. There might be many causes of these crises. However, previous studies like those of Gay (2008), Liu and Shrestha (2008), Majid and Yusof (2009) and Mofleh (2011), among others, show a link between the changes in price of the stock market to the movement of Macroeconomic factors. As a result, it is very important to study the relationships between the Thai stock market and the selected Macroeconomic factors in order to understand more about the relationships between real economic activity and the behavior of the Stock Exchange of Thailand (SET).

In addition, while a lot of work has been done on SET alone, this research also provides an alternative aspect on the relationships between SET property development index and the Macroeconomic factors. Specifically, the research aims to evaluate the sensitivity of SET property development index to the movement of exchange rate, Interest rate and inflation rate in order to compare the result with the sensitivity of SET index. Therefore, this study aims to answer the following general questions:

1. Do the selected Macroeconomic factors have impacts on SET index? If so, what are the directions of the impacts?

2. Do the selected Macroeconomic factors have impacts on SET property development index? If so, what are the directions of the impacts?

3. Does the SET property development index have relationships with SET index?

1.3 Research Objectives

In this research, the main objective is to investigate whether Macroeconomic factors individually and/or collectively contribute both SET index and SET property development index. More specifically, this study seeks to examine the impacts of three Macroeconomic factors on both indices over the period of time from January 2002 to December 2011. These Macroeconomic factors are: Exchange rate (EX), Thai Baht to US Dollar; Interest rate, policy rate (PR); Inflation rate in the Thai economy measured by the change of consumer price index comparing to previous year (CCPI).

These three variables were selected for two main reasons. First, these three variables are commonly used in the literature to study the theoretical links between stock market and Macroeconomic factors. Second, two of the variables are available at a monthly frequency except the exchange rate which is available at a daily frequency. Overall, the specific objectives of this study are:

1.3.1. To find the impacts of Macroeconomic factors on SET index.

1.3.2. To find the impacts of Macroeconomic factors on SET property development index.

1.3.3. To find the relationships between SET index and SET property development index.

1.4 Scope of the Research

This research focuses on a benchmark stock index in Thailand called the SET index. It is a composite index which represents the price movement for all common stocks trading

on the SET and the SET property development index which is a capitalization-weighted index of all stocks of the SET Index that are involved in the property sector except the property fund securities. The main goal is to examine whether the impact of selected Macroeconomic factors: Exchange rate, Interest rate and Inflation rate on SET property development sector is greater than the SET as a whole for the study period from January 2002 to December 2011.

The trend of each dependent variable (SET index and SET property development index) and independent variable (Exchange rate, Interest rate and Inflation rate) adopted for this study are displayed in the following five figures.

Figure 1: SET Index

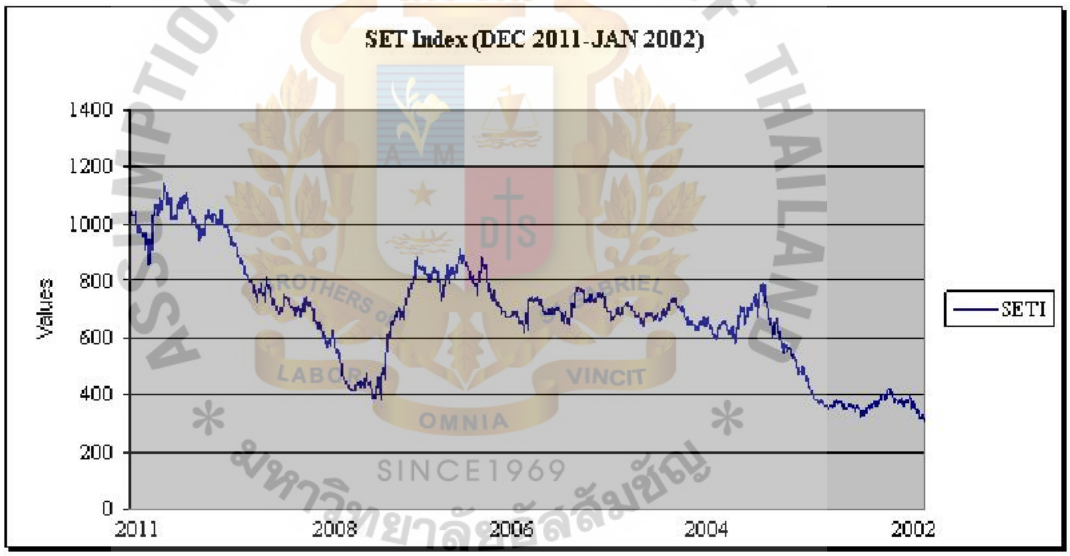


Figure 1 displays the SET index movement over the period from 31 December 2011 to 1 January 2002. The trend of SET index was in the bottom in 2002 and continued steadily upward through 2003 to 2006. In 2007, the rates started to decrease and reached it bottom in 2008. The reason behide this situation might be there was “Hamburger Crisis”, a critical situation arising from non-performing loan which immediately affects the stock of Thailand exchange in 2008. However, the rates were increasing soon afterward.

Figure 2: SET Property Development Index

Figure 2 displays the SET property development index movement over the period from 31 December 2011 to 1 January 2002. The trend of SET property development seems to be very volatility. The rates peaked in the forth quarter of 2003 and reached it bottom in 2008 (the same reason as SET index). However, the rates seemed to be slowly recovering through 2009 to 2011.

Figure 3: Exchange Rate TH Baht to US Dollar

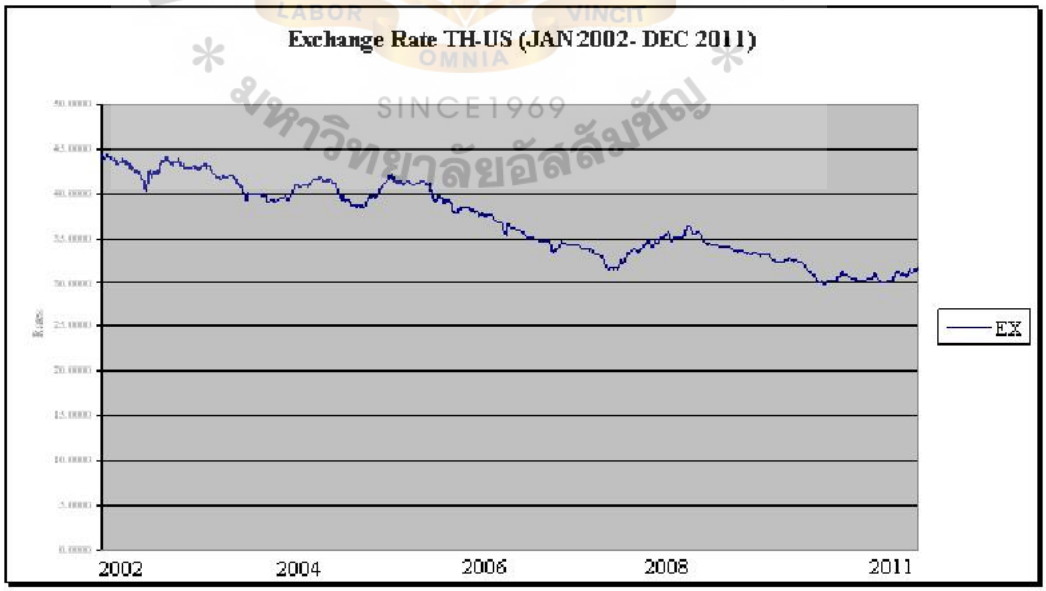


Figure 3 displays the exchange rate TH Baht to US Dollar movement over the period from 1 January 2002 to 31 December 2011. The trend of exchange rate is not very volatility. The rates peaked in 2002 and continued steadily downward through 2003 to 2009 until it reached it bottom in 2010. That means Thai baht rose to the highest level in 2010 as the outlook for economic growth and speculation interest rate may raise further encouraged investors invest into Thai stocks and bonds.

Figure 4: Policy Rate

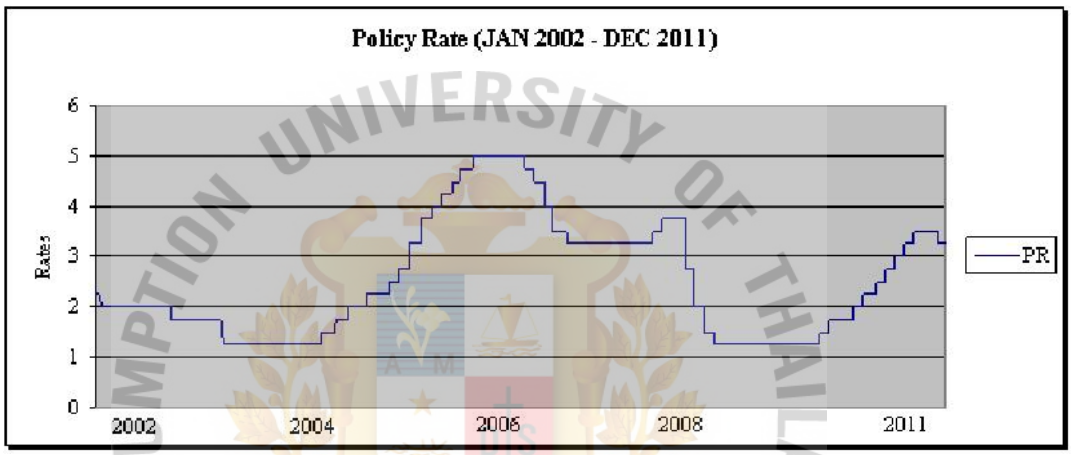


Figure 4 displays the policy rate movement over the period from 1 January 2002 to 31 December 2011. The rate was at the bottom in 2003 and continued steadily upward through 2004 to 2005 and peaked in 2006. However, the rates stared to move downward through 2006 to 2008 due to politic problems in Thailand that occurred at the end of 2006, as well as, “Hamburger Crisis” in 2008.

Figure 5: Inflation Rate

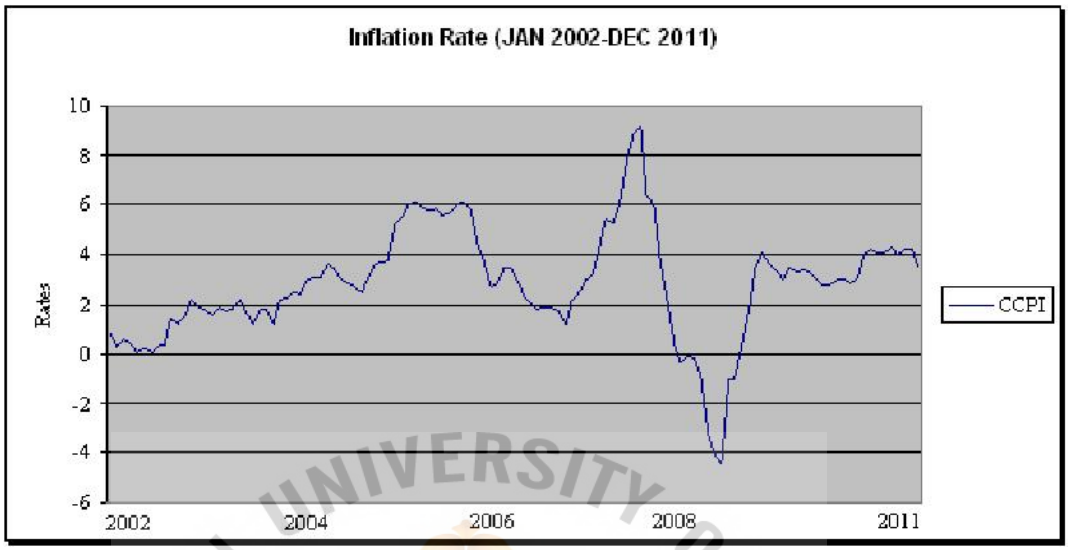


Figure 5 displays the inflation rate movement over the period from January 2002 to December 2011. The trend of inflation rate in Thailand seems to be very volatility. The rate was reached its peak of 9.20 percent in 2008 as the price of oil was high. However, the rates continued downward and reached a record low of – 4.40 percent in 2009 as the price of oil was deceased compare to the price of oil in 2008, as well as, Thai Government implemented price control policy on food and other groceries.

1.5 Limitations of the Research

This study is limited to the property development sector which belongs to the property and construction industry in the SET and the whole Thai stock market (SET). Therefore, it may not reflect other industries in the SET. It also does not reflect other markets in the world. Another limitation is all of the variables are available at a daily frequency except the inflation rate and interest rate which is available at a monthly frequency. Moreover, the limitation of this study is that the researcher realizes there are other Macroeconomic factors that can affect both indices. Thus, this study is limited to the consideration where the independent variables are exchange rate, interest rate and inflation rate.

1.6 Significance of the study

At the completion of this research, the research hopes that this study will benefit the following parties:

1. Private investors and portfolio managers

The result of this research would help private investors and portfolio managers deepen their understanding of the relationships between Macroeconomic factors and Thai stock market, especially, Thai property development stock.

2. Academicians

Academicians in the area of investment can benefit from this study. This research may also be used for further researches in the future or for different indices in SET.

1.7 Definition of the Terms

Consumer Price Index – A measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services (U.S. Bureau of Labor Statistics, http://www.bls.gov/cpi/cpifaq.htm accessed on September 19, 2012).

Exchange Rate – The rate at which one currency will be exchanged for another currency (Sullivan and Sheffrin, 2003).

Inflation Rate – A measure of inflation, or the percentage rate of change in price level over time, usually one year (Sullivan and Sheffrin, 2003). In this study, inflation rate is quoted during 2002-2011.

Interest Rate – The rate at which interest is paid by a borrower for the use of money that they borrow from a lender (Sullivan and Sheffrin, 2003).

Policy Rate - An interest rate set by Bank of Thailand in order to conduct monetary policy under the inflation-targeting framework, the monetary stance is indicated through the policy rate (Bank of Thailand, http://www.bot.or.th/English/MonetaryPolicy/Decision/PolicyRate/Pages/index.aspx accessed on September 17, 2012).

SET – The Stock Exchange of Thailand (SET) was established by act of stock exchange of Thailand legislation in 1974 (The Stock Exchange of Thailand, http://www.set.or.th/th/about/overview/history_p1.html accessed on September 17, 2012).

SET Index – A composite index which represents the price movement for all common stocks trading on the SET. (The Stock Exchange of Thailand, http://www.set.or.th/th/products/index/setindex_p1.html accessed on September 17, 2012).

SET Property Development Index – A capitalization-weighted index of all stocks of the SET Index that are involved in the property sector except the property fund securities (Bloomberg, http://www.bloomberg.com/quote/SETPROP:IND accessed on September 17, 2012).

1.8 Abbreviations

Abbreviation	Full Form
ASPI	All Share Price Index
ARCH	Auto-Regressive Conditional Heteroskedasticity
BOT	The Bank of Thailand
BRIC	Brazil, Russia, India and China
CPI	Consumer Price Index
EGARCH	Exponential General Auto-Regressive Conditional Heteroskedasticity
EX	Exchange Rate
GARCH-M	General Auto-Regressive Conditional Heteroskedasticity in Mean
GDP	Gross Domestic Product
IMF	International Monetary Fund
KPSS	Kwiatkowski–Phillips–Schmidt–Shin test
OLS	Ordinary Least Squares
PR	Policy Rate
REIT	Real Estate Investment Trust
SET	The Stock Exchange of Thailand
SETI	SET Index
SETPDI	SET Property Development Index
SETSMART	SET Market Analysis and Reporting Tool
TASI	The Tadawul All-Share Index
US	United States
VAR	Vector Auto Regression Model

CHAPTER 2
REVIEW OF RELATED LITERATURE AND STUDIES

The following review of literature provides a typical sample of studies conducted into the relationships between stock markets and the selected Macroeconomic factors and the purpose is to expose the common factors, methodology and the results of the several studies conducted in this area of research. Firstly, it begins with describing research conducted into the relationships between exchange rate and stock markets and then proceeds to describe the relationships between interest rate and stock markets and continues to describe the same type of studies for inflation rate and stock markets. Next, the studies indicated on the relationships between stock markets and Macroeconomic factors will be presented at both multi-country level and single-country level.

2.1 Stock Investment

In general, stock investment is an investment on a common stock that investors purchase on the stock market for making profits from dividends distribution and capital gain. At the same time, the investors take a risk of having no return or losing money from capital loss.

The reasons why investors like to invest in stock are:

1. The average return of common stocks may be higher than the average return of other investments over time.
2. The risk on the portfolio can be greatly reduced by holding several types of stock through diversification.
3. It is not difficult to sell the common stocks on hand at any time since stocks are very liquid.
4. Comparing to other investments, the price of common stocks will be affected by not only a change in interest rates but also the earning and performance of the company.

There are two main types of company shares: common stock and preferred stock. Common stock representing a form of equity ownership in a corporation is also known as equity or a type of security. The holders of common stock have voting rights and receive not only dividends, but also capital gains from an increase in the capital value of the stock. Preferred stock is a class of ownership in a corporation, which has features of both equity and

debt instruments. The holders of preferred stock usually don't have voting rights, but they always receive dividends before any dividends are paid to the holders of common stock and have priority over common stock upon liquidation (Bodie *et al*, 2009). In this study, stock is referred to as common stock.

2.2 Stock Markets

A stock market is a place where shares are issued and investors can buy and sell stocks and other securities. The stock market is one of the most popular financial markets because it is not only the most important sources for companies to raise capital, but it also provides investors an opportunity to receive dividends and benefit from capital gains.
The stock market can be divided into two main markets: the primary and secondary markets

1. Primary Market

According to Keown *et al.* (2010), the primary market is a market for the issue of new securities including two different kinds of offerings which are initial public offerings (IPO) and seasoned new issues. In the primary market, the company can raise capital from the sale of new securities and investors can purchase securities directly from the issuer. As soon as the initial sale is done in the primary market, further transaction of buying and selling securities will be traded on the secondary market.

2. The Secondary Markets

According to Keown *et al.* (2010), the secondary market is a market in which previously issued securities are traded. In the secondary market, stocks are traded from one investor to another. In other words, the profits of selling securities on the secondary market directly go to the previous investor but not the issuer. The trading of securities goes through two types of secondary markets: organized exchanges and over-the-counter (OTC) market.

1) Organized Exchanges

There are a lot of organized exchanges in the world, such as, the New York Stock Exchange, the London Stock Exchange, Tokyo Stock Exchange, Hong Kong Stock Exchange and more. In Thailand, The Stock Exchange of Thailand (SET) is an organization set up by law as an orderly securities market with proper facilities and procedures for trading of listed securities.

2) Over-the-Counter (OTC) Market

According to Keown *et al.* (2010), the over-the-counter market is a market in which brokers buy and sell securities not listed on an exchange over the telephone and network. Companies in the OTC market are normally too new or too small so that they cannot be listed on a major exchange. Due to not having large enough shares available from these companies, small amounts of trading may importantly impact the price of stocks of these companies

2.3 Stock Market Index

With the popularity of stock investment, the world famous stock market index such as the Dow Jones Industrial Average (DJIA), the NASDAQ Composite, the S&P 500 and the Hang Seng Index are fast becoming household names. This study will briefly introduce the main stock market index in Thailand: SET index

SET Index is a composite market capitalization-weighted price index which compares the current market value of all listed common stocks with its market value on the base date of April 30, 1975, which was when the SET Index was established. The SET Index was set at 100 points on the Base date.

$$\text{SET Index} = \frac{\text{Current Market Value}}{\text{Base Market Value}} \times 100$$

2.4 Real Estate Investment

According to Yang and Ye (2010), real estate is a legal term that refers to things that are immovable such as land and anything fixed or permanently attached to the land, such as buildings, roads and trees. However, some people prefer to use the term real estate as ownership rights over real estate which can be bought, sold, and leased. This is also called real property or physical property. There are several ways to invest on real estate. The most common ways are generating capital gain through price appreciation and getting rental income from tenants, real estate investment doesn't involve only buy and sale of real estate, but also ownership, management and lease of real estate.

The reasons why investors like to invest in real estate are:

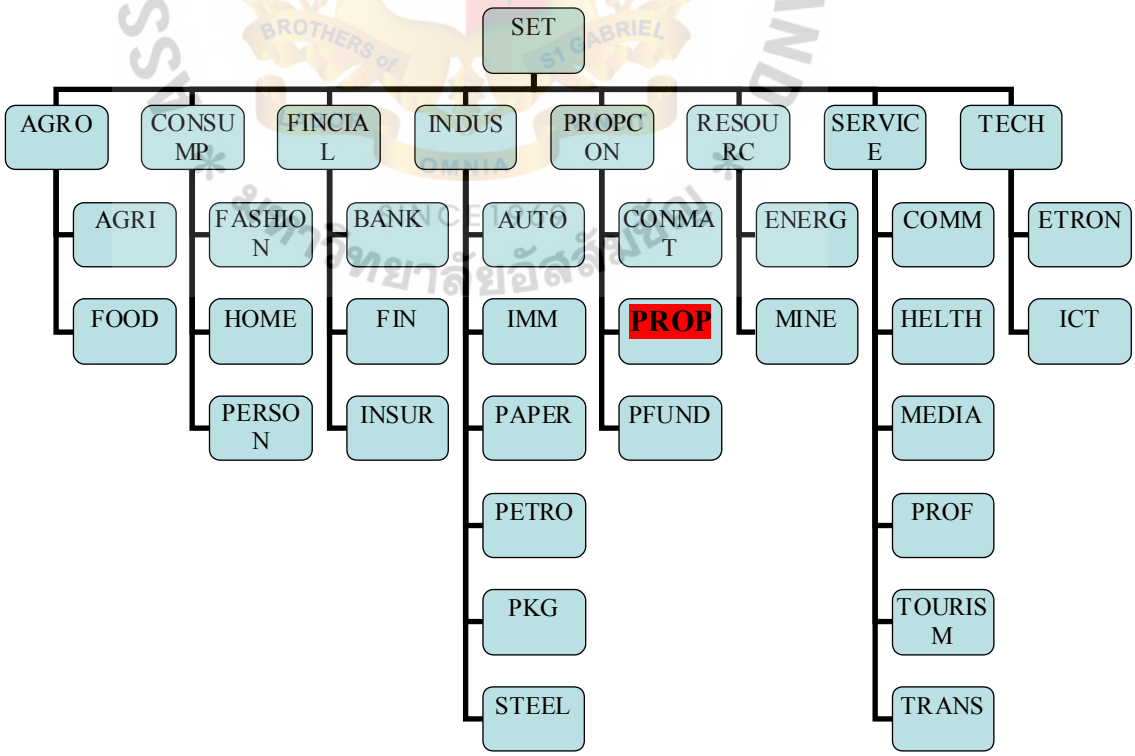
1. Real estate investor or the owner of real estate can have rental income from the tenants.

2. Real estate investor can benefit from changes in the value of the real estate which is called appreciation.
3. Real estate investor can gain greater returns by using financial leverage.
4. Real estate as an inflation hedge is an investment that keeps the real wealth of investors.
5. Real estate may also be a portfolio asset for investors to diversify their investment

Moreover, according to Brown and Matysiak (2000), more than 50 percent of the world's total assets are invested in direct real estate and securitized real estate investment vehicles such as real estate investment trusts (REITs) or real estate stocks. It can be clearly seen that investors in real estate can choose to invest directly in physical property or invest indirectly through the purchase of shares in real estate companies. In Thailand, the stocks of these companies generally known as property stock.

In addition to the SET index, which is calculated from the prices of all common stocks on the main board, the SET also provides eight industry groups index and each industry group has several sectors index. Please see figure 6.

Figure 6: SET's Chart



Property stocks belong in SET Property Development Index. Bloomberg describes SET Property Development Index as a capitalization-weighted index of all stocks of the SET Index that are involved in the property sector except the property fund securities. SET Property Development Index consists of 63 stocks.

The following table shows top ten companies that have highest registered capital in this sector.

Table 2.1: Top ten highest registered capital companies

No.	Company	Registered Capital (Baht)
1	Natural Park Public Company Limited	120,861,840,000
2	Krisdamahanakorn Public Company Limited	52,544,489,440
3	Bangkok Land Public Company Limited	26,671,687,159
4	Gen Land Property Development Public Company Limited	16,382,133,790
5	Sansiri Public Company Limited	11,641,569,086
6	Land and Houses Public Company Limited	10,354,268,670
7	Quality Houses Public Company Limited	9,183,784,642
8	Hemaraj Land and Development Public Company Limited	6,000,000,000
9	Property Perfect Public Company Limited	5,961,161,256
10	Italian-Thai Development Public Company Limited	5,871,149,452

2.5 Returns and Risks of Stock Investment

There are two ways to receive the returns from investing in stocks: Dividend and capital gain. The Dividend is payment made by a company to its shareholder as it is the portion of company profits paid out to stockholders. The Capital gain is the difference between a higher selling price and a lower purchase price. The capital gain can be realized as soon as the capital asset is sold. However, the investors also take a risk of having no return as the company has no profit or losing money from capital loss. The capital loss is opposite to capital gain, the difference between a lower selling price and a higher purchase price.

2.6 Exchange rate

The relationship between the stock market prices and the exchange rate movements has been explained within the context of two portfolio models of exchange rate transmission mechanism within an economy, namely, the Flow-Oriented model which was introduced by Gavin (1989) and the Stock-Oriented model which was introduced by Frankel (1983)

According to the Flow-Oriented model, exchange rate movement affects the output levels of firms and also the trade balance of an economy. Share price movements on the stock market also affect total demand through wealth, liquidity effects and indirectly, the exchange rate. A reduction in stock prices reduces wealth of local investors and further reduces demand for money with following implications for currency depreciation. This follows the monetarist models of exchange rate determination (Gavin, 1989).

In the case of the "Stock-Oriented" model, the stock market exchange rate link is explained through a country's capital accounts. In this model, the exchange rate equalizes demand and supply for assets (Stocks). Therefore, expectations of relative currency movements have a significant impact on price movements of financially held assets. Thus, stock price movements may influence or be influenced by exchange rate movements. For example, the depreciation of Thai currency against US currency increases returns on the US currency. This induces investors to shift funds from Thai assets (stocks) towards US assets, depressing stock prices. Thus, a depreciating currency has a negative impact on stock market returns.

The theoretical link between exchange rate and stock prices is also derived within an efficient market environment. It is important to note that in an efficient market environment the equity market should reflect company valuations. Consequently, expectations of future variables should incorporate all available information at the time the expectations are formed. Therefore, in an efficient market, no expected risk-adjusted arbitrage should be profitable. A parity condition frequently used in such conditions is the uncovered interest parity, which is based on the efficient markets hypothesis.

According to Pavlova and Rigobon (2003), uncovered interest rate is a relationship between local interest rates, foreign interest rates and the expected exchange rate. To be more specific, uncovered interest rate parity is a relationship which assumes that arbitrage will

enforce balance of returns on the following two investment strategies: one is investing in a home market and the other one is investing in a foreign market and converting proceeds into home goods value using the controlling terms of trade.

Therefore, the linkage between the exchange rate and the asset market equilibrium in an efficient market is then creates interest parity. From this viewpoint, exchange rate change is expected to give rise to stock price change. However, as argued by Granger et al. (2000), as the capital market becomes more and more integrated, changes in stock prices and exchange rates may reflect more of the capital movement than current account imbalance. Thus, a decrease in stock prices causes a reduction in the wealth of domestic investors, which in turn reduces the demand for money and lowers interest rates. The lower interest rates encourage capital outflows and then could lead to currency depreciation.

2.7 Previous studies between exchange rate and stock market

There are several studies that show the existence of long run relationships between exchange rate and stock market.

Chen and Chen (2012) examined the relationships between stock prices and exchange rates in twelve Organizations for Economic Co-operation and Development countries by using the bound testing methodology. Data gathered periods are different across countries depending upon the availability of data. The sample period is January 1974 to September 2007 for the US, Canada, Germany, Japan, Italy, France and the United Kingdom; January 1993 to September 2007 for Poland; January 1986 to September 2007 for Turkey; January 1981 to September 2007 for South Korea; January 1994 to September 2007 for the Czech Republic and January 1993 to September 2007 for Hungary. The result shows that a long-run level equilibrium relationship among the exchange rates and stock prices exists in only seven out of twelve countries.

Furthermore, Ray (2012) attempted to examine how changes in exchange rates and stock prices are related to each other, both in long as well as short run. The study is based on unit root test, Johansen cointegration test and granger causality test to examine long run and short run causality comprising the monthly closing prices of stock exchanges and exchange rates over the period of 2002-2010 for five Asian countries Hongkong, India, Japan, Korea and Singapore. Finally, the result suggested that in countries like Hongkong, Japan and Singapore, long run relationships exists between exchange rate and stock prices but short run

causality disappears whereas in case of India and Korea, short run unidirectional granger causality is found to exist but long run cointegrating relationships disappears.

Meanwhile, studies by Puah and Jayaraman (2007) and Bhunia (2012) have documented negative relationships between the stock markets and exchange rate.

Puah and Jayaraman (2007) investigated whether there are any causal relationships between capital stock prices and Macroeconomic factors which include nominal interest rate and exchange rate in Fiji for the period 1997 to 2004. They adopted unit roots and cointegration, error-correction model, to examine the causal relationships between capital stock prices and Macroeconomic factors. They found that a depreciation of currency could lead to higher stock returns. Nevertheless, the fluctuation in the short-run interest rate did not seem to matter in its influence on the stock market as the value of its coefficient was negligible.

Bhunia (2012) examined the causal relationships between stock prices and exchange rates in India. The study used national, services, financials, industrials, and technology indices as stock price indices and collected the data from 2 April 2001 to 31 March 2011. The Augmented Dickey-Fuller, Phillips- Perron and KPSS tests have been applied to determine the integrated level of each series and the Granger causality test have been applied to examine the causal relationships. The result indicated that there were negative causal relationships from exchange rate to all stock market indices.

However, it was argued by Joseph and Vezos (2006) that there is a positive relationships between the stock markets and exchange rate as Joseph and Vezos (2006) investigated the impact of foreign exchange and interest rate changes on US banks' stock returns. They employed both EGARCH model and the standard OLS estimation method in order to compare the sensitivity. After all, it can be found that the foreign exchange rate sensitivity coefficients are typically positive for both estimation methods which the coefficients for interest rate sensitivity carry a mix of positive and negative signs (for both models).

In addition, Adjasi *et al.* (2011) studied the relationships between stock prices and exchange rate movement in seven African countries for the selected period 1992-2005 by using vector autoregressive, co-integration and impulse response analysis to determine the long- and short-run linkages between stock prices and exchange rates. They found that the depreciation of exchange rate would decrease stock prices in either long run or short run in Tunisia, Ghana, Kenya, Mauritius and Nigeria. Nevertheless, the stock prices would be

increased in Egypt and South Africa. Their results indicate that there is uncertainty of the impact that the exchange rate has on one country's stock market.

The next section 2.8 explains the relationships between interest rate and stock market.

2.8 Interest rate

The volatility of interest rate over the past century is crucial for the pricing of assets, because they represent opportunities costs and negative relationship between the value of financial instrument and the level of interest rate. High interest rate reduces the present values of future cash flow, thereby reducing the attractiveness of investment opportunities. For this reason, real interest rate is key determinants of business investment expenditure. Interest rates are dependent not only on interest rate in other financial markets but also upon the real sector of the economy and consumption. The consideration of interest rate must be expanded to include the effect of inflation on returns. With inflation rate, a baht will be worth less in purchasing power than a baht at the time the stock was bought.

All these factors interact to determine an equilibrium structure of interest rate. Forecasting interest rate is one of the most difficult parts of applied Macroeconomics. The expected rate of inflation is one of the most important factors influencing interest rate forecasts. When the rate of inflation is higher, it will cause lenders to demand higher nominal rate of interest as to compensate for the erosion in their purchasing power. Borrowers are forced to pay higher rate if they want the funds.

Normally the interest rates that are published by the commercial banks are nominal rates. In a famous article written by Fisher (1896), it stated that the nominal rate was related to the real rate by the following equation:

Nominal interest rate = expected real rate + inflation premium + expected real rate * inflation

The real interest rate is the return to the lender or investor measured on term of its actual purchasing power and inflation premium, the rate of inflation expected by investors in the market place during the life of financial instruments. Fisher also stated that if the expected real rate is held fixed, change in nominal rate will reflect shifting inflation premium.

To approximate the rate of return on the stock, we can use the following formulas:

Average annual yield on stock = Average annual income from the stock / Average amount of funds invested in stock

2.9 Previous studies between interest rate and stock market

The relationships between interest rate and stock markets have been investigated by great number of studies.

Park and Choi (2011) studied interest rate sensitivity of the US property/liability insurer stock returns using various return generating process models incorporating different interest rate changes such as actual interest rate changes and unexpected interest rate changes. This study followed the 1974 two-index model by Stone. In the two-index model, three different interest rate indices are tested one at a time to examine if interest rate sensitivity of the insurers stock returns It is found that the US property/liability insurers' stock returns are sensitivity to interest rate changes. The impact of actual interest rate changes on the stock returns is little different from that of unexpected interest rate changes. Moreover, it also reports that the interest rate sensitivity of insurer stock returns is time varying.

In addition, Hyde (2007) also examined the sensitivity of stock returns at industry level to market, exchange rate and interest shocks in France's, Germany's, Italy's and the United Kingdom's markets by using the methodology of Campbell and Mei (1993) to study the market, exchange rate and interest rate risks of 33 industry sector groupings in France, Germany, Italy and the United Kingdom over the period January 1973 to June 2004. The researcher found that there are significant levels of exposure to exchange rate risk in industries in all four markets and also significant levels of interest rate risk are only recognized in Germany and France.

Wickremasinghe (2011) examined the causal relationships between stock prices and Macroeconomic factors in Sri Lanka. Data used in the paper consist of the ASPI of the Colombo stock exchange, US Dollar exchange rate expressed as the amount of Sri Lankan rupees per unit of US Dollar, three-month fixed deposit rate, Colombo consumers' price index, US stock market index, narrow M1, and the GDP of Sri Lanka on a monthly basis from January 1985 to December 2004. The results of the research indicate that there are both short and long-run causal relationships between stock prices and all of Macroeconomic factors.

According to Kim and Huang (2006) property stocks are also generally sensitive to changes in the long-term and short-term interest rates. They analyzed data for property stock indexes from 1987 to 2003 by using GARCH-M model and found that the results indicate changes in the ARCH parameter, risk premia, volatility persistence and interest rate level and volatility effects before and after the 1997 Asian financial crisis. Nevertheless, these changes are not similar and depend on the individual property market. Most of the literatures reveal that there is a positive relationship between interest rate and stock markets.

Adjasi (2009) analyzed the impact of Macroeconomic uncertainty on stock price volatility in Ghana. This study used two stages of method to analyze data. The first stage evaluate univariate volatility model for each Macroeconomic factors using EGARCH model and the second stage evaluate the volatility effect of Macroeconomic factors on stock price by using exogenous variables in the conditional variance equation of the stock price. It was found that higher volatility in interest rates increases volatility of the stock price.

Majid and Yusof (2009) also confirm on this point. They suggested that Treasury bill rate and federal fund rate seem to be suitable targets for the government to focus on, in order to stabilize the Islamic stock market and to encourage more capital flows into the market. This study employed the technique of autoregressive distributed lag model approach to co-integrate Macroeconomic factors which affect the Islamic stock market behavior in Malaysia using monthly data over the period May1999 to February 2006. Moreover, they also found that when interest rates rised either domestically or internationally, the Muslim investors will buy more Shari'ah compliant stocks; thereby escalating the Islamic stock prices.

However, Hussainey and Ngoc (2009) argued that the long-term and short-term interest rates are not affecting stock prices in the same direction. (Short-term interest rates have a significantly positive association while long-term ones have a significantly negative association with stock prices) as they investigated the effects of Macroeconomic indicators on Vietnamese stock prices. To be noticed, this study focuses on US Macroeconomic indicators and the data was gathered from January 2001 to April 2008.

The next section 2.10 explains the relationships between interest rate and stock market.

2.10 Inflation rate

When the price of most goods and services are rising over time, the economy is said to be experiencing inflation. Sullivan and Sheffrin (2003) define inflation rate as a measure of inflation, or the rate of increase of a price index such as the consumer price index. In other

words, inflation rate is the rate at which the general level of the price rising. High rates of inflation often are associated with “overheat” economies, that is, economies where the demand for goods and services is out-striping productive capacity, which leads to upward pressure on prices. Usually, government tries to stimulate their economies enough to maintain nearly full employment, but not so much as to bring an inflationary pressure

The relation between the inflation rate and the stock market has frequently been a subject of focus on many researches. Theories suggest that any inflation rate, which is correctly and universally anticipated by the financial market, should have no effect at all on the stock price. In short, if everybody in the financial market regarding future inflation than the inflation itself, the inflation rate should have zero effect on the price of the common stock.

It is generally accepted the stock return are negative to expected inflation, unexpected inflation and changes in expected inflation. For example, stock price of any positive relation to the dividend that investors expect the company to pay to shareholders in future periods is negatively related to risks attached to that stream of expected dividend. The following formula shows the relationships between them:

$$\text{Price per share} = E(D_t) / (1+r)^t$$

Where,

$E(D_t)$ = Expected dividend payment in each period t

r = the rate of discount (Present value)

The more risky the company’s dividend streams, the higher rate of return to compensate them for the added risk of holding the stock. It is obvious that if the rise in expected inflation raises stock price, it must increase the amount of dividend that shareholders expect each company to pay them, or lower the perceived risk of holding stock or both. On the other hand, stock price will tend to fall with higher inflation if investors lower their dividend expectations, or the inflation increases the perceived risk to shareholders or both.

2.11 Previous studies between inflation rate and stock market

Several studies have confirmed that there is a negative relationship between inflation rate and stock market.

Kim and Shukla (2006) researched the cross-sectional variation in the relation between international security returns and expected inflation based on their sensitivities to world stock factors. They collected monthly stock market index values for 23 countries over the period from 1988 to 2002 and also monthly inflation rates for the world are computed based on the monthly Consumer Price Index for industrial countries available in the IMF International Financial Statistics. It was found that the inflation sensitivity of a security is negatively related to its sensitivity to the world stock index.

Anthony and Kwame (2008) examined how Macroeconomic indicators affect the performance of Ghana's stock market. Quarterly time series data were gathered from 1991 to 2005 for the Ghana stock exchange. The researchers found that inflation rate is found to have a negative effect on stock market performance as well as lending rates from deposit money banks have an adverse effect on stock market performance.

Gay (2008) investigated the relationships between stock market returns and the Macroeconomic factors such as gross domestic product (GDP), consumer price index, M1 money supply, the foreign exchange rate and oil price in Brazil, Russia, India and China (BRIC) for the period January 1999 to June 2006. The researcher used Vector Autoregressive Model to obtain the relationships between the stock market price and Macroeconomic factors. The results showed that the stock prices being positively related to GDP and negatively related to CPI, the exchange rate and oil price for all four countries.

Liu and Shrestha (2008) investigated the relationships between the Chinese stock market indices and a set of Macroeconomic factors (money supply, industrial production, inflation, exchange rate and interest rates). The data were obtained from International Financial Statistics, published by the International Monetary Fund as monthly data covering January 1992 to December 2001. The results of this research show that the co-integrating relationship does exist between stock prices and the Macroeconomic factors in the highly speculative Chinese stock market. Moreover, there is a negative relationship between exchange rate; inflation rate; interest rate and stock prices in China. On the other hand, there is a positive relationship between money supply; industrial production and stock prices in China.

Mofleh (2011) investigates the long run and short run relationships between Saudi stock market (TASI) returns and eight Macroeconomic factors over the period January 1993

to December 2009 by using a wide range of Vector autoregression and generalized autoregressive conditional heteroskedasticity models. The results showed that there was a significant negative relationship between interest rate, inflation rate and TASI. In addition, the paper also suggested a positive long relationship between exchange rate and TASI. Several studies mentioned above all reveal the negative relationships of inflation rate toward the stock markets.

In addition, for property stock, Kim *et al.* (2006) analyzed the relationships between expected risk premia on property stocks and some major Macroeconomic risk factors. This study collected monthly price index dataset from the DataStream International. The markets (indexes) studied are: Hong Kong (Hang Seng Property Index), Singapore (Singapore All-Equity Property), Japan (Tokyo SE Real Estate Index) and the United Kingdom (Financial Times Real Estate Index) over the sample period from May 1986 to March 2003 and the Macroeconomic factors are growth in gross domestic product, industrial production output growth, unexpected inflation, interest rate, money supply growth and changes in exchange rate. They found that the expected risk premia and the conditional volatilities of the risk premia on property stocks are time-varying and dynamically linked to the conditional volatilities of the Macroeconomic risk factors. However there are some contradictions in the significance, as well as directions of impact in the Macroeconomic risk factors across the property stock markets.

The following tables (Table 2.2 – Table 2.11), summarized the relationships between Macroeconomic factors and stock market. In addition, Table 2.12 summarized the directions of the impacts of Macroeconomic factors on stock market.

Table 2.2: Summary of studies in Relation between Exchange Rate and Stock Market

No.	Author	Title
	Objective	**Methodology**
	Finding	
1	Nathan Lael Joseph, Panayiotis Vezos, (2006)	The sensitivity of US banks' stock returns to interest rate and exchange rate changes
	The purpose of this paper is to investigate the impact of foreign exchange and interest rate changes on US banks' stock returns	The approach employs an EGARCH model to account for the ARCH effects in daily returns. For comparative purposes, the standard OLS estimation method is also used to measure sensitivity
	The findings are as follows: under the conditional t-distributional assumption, the EGARCH model generated a much better fit to the data although the goodness-of-fit of the model is not entirely satisfactory; the market index return accounts for most of the variation in stock returns at both the individual bank and portfolio levels; and the degree of sensitivity of the stock returns to interest rate and foreign exchange rate changes is not very pronounced despite the use of high frequency data. Earlier results had indicated that daily data provided greater evidence of exposure sensitivity.	
2	Chin-Hong Puah and T.K. Jayaraman, (2007)	Macroeconomic Activities and Stock Prices in a South Pacific Island Economy
	This paper investigates whether there is any causal relationship between capital stock prices and Macroeconomic factors which include nominal interest rate and exchange rate in Fiji for the period 1997 to 2004.	The paper adopts unit roots and cointegration, error-correction model, to examine the causal relationships between capital stock prices and Macroeconomic factors.
	The results show that a depreciation of currency could lead to higher stock returns. Nevertheless, the fluctuation in the short-run interest rate does not seem to matter in its influence on the stock market as the value of its coefficient is negligible.	
3	Charles K.D. Adjasi, Nicholas B. Biekpe, Kofi A. Osei, (2011)	Stock prices and exchange rate dynamics in selected African countries: a bivariate analysis
	The paper aims to investigate the relationships between stock prices and exchange rate movement in seven African countries.	It uses vector autoregressive (VAR) cointegration and impulse response analysis to determine the long-run and short-run linkages between stock prices and exchange rates.
	Cointegration analyses indicate a long-run relationship between stock prices and the exchange rate in Tunisia, where exchange rate depreciation drives down stock prices. Impulse response analyses for other countries show that stock returns in Ghana, Kenya, Mauritius and Nigeria reduce when induced by exchange rate shocks but increase in Egypt and South Africa. Shocks induced by either stock prices or the exchange rate are more protracted in Ghana, Kenya, Mauritius and Nigeria than in South Africa and Egypt.	

Table 2.3: Summary of studies in Relation between Exchange Rate and Stock Market (Continued 1)

No.	Author	Title
	Objective	**Methodology**
	Finding	
4	Amalendu Bhunia, (2012)	A causal relationships between stock indices and exchange rates-empirical evidence from India
	This paper examines the causal relationships between stock prices and exchange rates	The paper uses national, services, financials, industrials, and technology indices as stock price indices and collected the data from 2 April 2001 to 31 March 2011 about India. The Augmented Dickey-Fuller (ADF), Phillips- Perron (PP) and KPSS tests have been applied to determine the integrated level of each series and the Granger causality test have been applied to examine the causal relationships.
	The result of the study indicates that there is negative causal relationships from exchange rate to all stock market indices is determined.	
5	Shyh-Wei Chen, Tzu-Chun Chen, (2012)	Untangling the non-linear causal nexus between exchange rates and stock prices: New evidence from the OECD countries
	The purpose of this paper is to examine the relationships between stock prices and exchange rates in 12 OECD countries.	The authors examine the nexus of stock prices and exchange rates for 12 OECD countries by using the vector error correction model, the bounds testing methodology and linear and non-linear Granger causality methods.
	The empirical results substantiate that a long-run level equilibrium relationships among the exchange rates and stock prices exists in only seven out of twelve countries. The results of the linear causality tests indicate that significant short-run and long-run causal relationships exist between the two financial markets. The results of the tests for non-linear Granger causality suggest that unidirectional and bidirectional non-linear causal relationships exist between stock prices and exchange rates among these OECD countries.	

Table 2.4: Summary of studies in Relation between Exchange Rate and Stock Market (Continued 2)

No.	Author	Title
	Objective	Methodology
	Finding	
6	Sarbapriya Ray, (2012)	A bivariate exploration into stock prices and exchange rate dynamics in selected Asian economies
	This paper attempts to examine how changes in exchange rates and stock prices are related to each other, both in long as well as short run.	This study is based on unit root test, Johansen cointegration test and granger causality test to examine long run and short run causality comprising the monthly closing prices of stock exchanges and exchange rates over the period of 2002-2010for five Asian countries Hong Kong, India, Japan, Korea and Singapore.
	The result suggests that in countries like Hong Kong, Japan and Singapore, long run relationships exists between exchange rate and stock prices but short run causality disappears whereas in case of India and Korea, short run unidirectional granger causality is found to exist but long run cointegrating relationships disappears.	

Table 2.5: Summary of studies in Relation between Interest Rate and Stock Market

No.	Author	Title
	Objective	**Methodology**
	Finding	
1	Kim Hiang Liow, Qiong Huang, (2006)	Interest rate risk and time-varying excess returns for Asian property stocks
	Aims to investigate whether the level and volatility of interest rates affect the excess returns of major Asian listed property markets within a time-varying risk framework.	A three-factor model is employed with excess return volatility, interest rate level and interest rate volatility as its factors. The generalized autoregressive conditionally heteroskedasticity in the mean (GARCH-M) analyzes are undertaken on monthly excess returns of property stock indexes for the period 1987-2003.
	Property stocks are generally sensitive to changes in the long-term and short-term interest rates and to a lesser extent, their volatility. Moreover, there are disparities in the magnitude as well as direction of sensitivities in interest rate level and volatility across the listed property markets and under different market conditions. Overall, results indicate changes in the ARCH parameter, risk premia, volatility persistence and interest rate level and volatility effects before and after the 1997 Asian financial crisis. However, these noted changes are not uniform and depend on the individual listed property markets.	
2	Stuart Hyde, (2007)	The response of industry stock returns to market, exchange rate and interest rate risks seeks
	This study seeks to investigate the sensitivity of stock returns at the industry level to market, exchange rate and interest rate shocks in the four major European economies: France, Germany, Italy, and the UK.	The paper utilizes the methodology of Campbell and Mei (1993) to decompose systematic risks into components attributable to news about future dividends (cash flows), real interest rates and excess returns.
	In addition to significant market risk, the paper finds significant levels of exposure to exchange rate risk in industries in all four markets. Significant levels of interest rate risk are only identified in Germany and France. All three sources of risk contain significant information about future cash flows and excess returns.	

Table 2.6: Summary of studies in Relation between Interest Rate and Stock Market (Continued 1)

No.	Author	Title
	Objective	Methodology
	Finding	
3	Charles K.D. Adjasi, (2009)	Macroeconomic uncertainty and conditional stock-price volatility in frontier African markets: Evidence from Ghana
	The purpose of this paper is to analyse the impact of Macroeconomic uncertainty on stock-price volatility in Ghana	The method of analysis is in two stages. The first stage estimates univariate volatility models for each Macroeconomic variable using the EGARCH model. In the second stage volatility effect of Macroeconomic factors on stock prices is estimated using the most recent squared residuals from the mean-conditional variance of Macroeconomic factors as exogenous variables in the conditional variance equation of the stock price.
	The results show that higher volatility in cocoa prices and interest rates increases volatility of the stock prices, whilst higher volatility in gold prices, oil prices, and money supply reduces volatility of stock prices.	
4	Khaled Hussainey, Le Khanh Ngoc, (2009)	The impact of Macroeconomic indicators on Vietnamese stock prices
	The purpose of this paper is to investigate the effects of Macroeconomic indicators (the interest rate and the industrial production) on Vietnamese stock prices. The paper examines how US Macroeconomic indicators affect Vietnamese stock prices.	The authors use monthly time series data covering the period from January 2001 to April 2008. The methodology introduced by Nasseh and Strauss and Canova and de Nicolo to investigate the linkage between stock prices and Macroeconomic indicators.
	This paper provides the first empirical evidence that there are statistically significant associations among the domestic production sector, money markets, and stock prices in Viet Nam. Another novel finding is that the US Macroeconomic fundamentals significantly affect Vietnamese stock prices. Finally, the results show that the influence of the US real sector is stronger than that of the money market	

Table 2.7: Summary of studies in Relation between Interest Rate and Stock Market (Continued 2)

No.	Author	Title
	Objective	**Methodology**
	Finding	
5	M. Shabri Abd. Majid, Rosylin Mohd. Yusof, (2009)	Long-run relationships between Islamic stock returns and Macroeconomic factors: An application of the autoregressive distributed lag model
	The purpose of this paper is to explore the extent to which Macroeconomic factors affect the Islamic stock market behavior in Malaysia in the post 1997 financial crisis period.	The paper employs the latest estimation technique of autoregressive distributed lag (ARDL) model approach to cointegration.
	The results suggest that real effective exchange rate, treasury bill rate (TBR) and federal fund rate (FFR) seem to be suitable targets for the government to focus on, in order to stabilize the Islamic stock market and to encourage more capital flows into the market. As for the interest rates and stock returns relationships, the paper finds that when interest rates rise either domestically (TBR) or inter nationally (FFR), the Muslim investors will buy more Shari'ah compliant stocks; thereby escalating the Islamic stock prices.	
6	Jin Park, B. Paul Choi, (2011)	Interest rate sensitivity of US property/liability insurer stock returns
	The purpose of this study is to investigate interest rate sensitivity of the US property/liability insurers stock returns using various return generating process models incorporating different interest rate changes such as actual interest rate changes, unexpected interest rate changes and orthogonalized market returns.	The study follows the 1974 two-index model by Stone. In the two-index model, three different interest rate indices are tested one at a time to examine if interest rate sensitivity of the insurers stock returns, if any, is vulnerable to an interest rate index used.
	It is found that the US property/liability insurers' stock returns are sensitivity to interest rate changes. The impact of actual interest rate changes on the stock returns is little different from that of unexpected interest rate changes, which is consistent with findings in the banking literature. When orthogonalized market returns are used in the models in lieu of actual market returns, the statistical significance on the estimated interest rate sensitivity of the returns improves. Consistent with extant studies of financial institution's interest rate sensitivity, the paper also reports that the interest rate sensitivity of insurer stock returns is time varying.	

Table 2.8: Summary of studies in Relation between Interest Rate and Stock Market (Continued 3)

No.	Author	Title
	Objective	Methodology
	Finding	
7	Guneratne Wickremasinghe, (2011)	The Sri Lankan stock market and the macroeconomy: an empirical investigation
	The purpose of this paper is to examine the causal relationships between stock prices and Macroeconomic factors in Sri Lanka.	The paper adopts unit roots and cointegration, error-correction model, variance decomposition analysis, and impulse responses analysis to examine the causal relationships between six Macroeconomic factors.
	The results indicate that there are both short and long-run causal relationships between stock prices and Macroeconomic factors. These finding refute the validity of the semi-strong version of the efficient market hypothesis for the Sri Lankan share market and have implications for investors, both domestic and international.	

Table 2.9: Summary of studies in Relation between Inflation Rate and Stock Market

No.	Author	Title
	Objective	**Methodology**
	Finding	
1	Kim Hiang Liow, Muhammad Faishal Ibrahim, Qiong Huang, (2006)	Macroeconomic risk influences on the property stock market
	The purpose of this paper is to provide an analysis of the relationships between expected risk premia on property stocks and some major Macroeconomic risk factors as reflected in the general business and financial conditions.	Employs a three-step estimation strategy (principal component analysis, GARCH and GMM) to model the Macroeconomic risk variables (GDP growth, INDP growth, unexpected inflation, money supply, interest rate and exchange rate) and relate them to the first and second moments on property stock excess returns of four major markets, namely, Singapore, Hong Kong, Japan and the UK. Macroeconomic risk is measured by the conditional volatility of Macroeconomic factors.
	The expected risk premia and the conditional volatilities of the risk premia on property stocks are time-varying and dynamically linked to the conditional volatilities of the Macroeconomic risk factors. However, there are some disparities in the significance, as well as direction of impact in the Macroeconomic risk factors across the property stock markets. Consequently, there are opportunities for risk diversification in international property stock markets.	
2	Moon K. Kim, Ravi Shukla, (2006)	Inflation and bond-stock characteristics of international security returns
	The purpose of this research is to explain the cross-sectional variation in the relation between international security returns and expected inflation based on their sensitivities to world stock and bond factors.	The paper shows regression of inflation sensitivities of returns on country indexes and international mutual funds on their sensitivities to world stock and bond indexes.
	This paper shows the inflation sensitivity of a security is positively (negatively) related to its sensitivity to the world bond index (world stock index).	

Table 2.10: Summary of studies in Relation between Inflation Rate and Stock Market (Continued 1)

No.	Author	Title
	Objective	Methodology
	Finding	
3	Anthony Kyereboah-Coleman, Kwame F. Agyire-Tettey, (2008)	Impact of Macroeconomic indicators on stock market performance: The case of the Ghana Stock Exchange
	The study aims at examining how Macroeconomic indicators affect the performance of stock markets by using the Ghana Stock Exchange as a case study.	Quarterly time series data covering the period 1991-2005 were used. Cointegration and the error correction model techniques are employed to ascertain both short-and long-run relationships.
	Findings of the study reveal that lending rates from deposit money banks have an adverse effect on stock market performance and particularly serve as major hindrance to business growth in Ghana. Again, while inflation rate is found to have a negative effect on stock market performance, the results indicate that it takes time for this to take effect due to the presence of a lag period; and that investor's benefit from exchange-rate losses as a result of domestic currency depreciation.	
4	Robert D. Gay, Jr., (2008)	Effect of Macroeconomic factors on stock market return for four emerging economies: Brazil, Russia, India and China
	The purpose of this study is to investigate the relationships between stock market returns and the Macroeconomic factors in Brazil, Russia, India and China.	The paper uses Vector Autoregressive Model (VAR) to obtain the relationships between the stock market price and Macroeconomic factors.
	The results show that the stock prices being positively related to GDP and negatively related to CPI, the exchange rate and oil price for all four countries.	
5	Ming-Hua Liu, Keshab M. Shrestha, (2008)	Analysis of the long-term relationships between macro-economic variables and the Chinese stock market using heteroscedastic cointegration
	The purpose of this paper is to investigate the relationships between the Chinese stock market indices and a set of macro-economic variables, i.e. money supply, industrial production, inflation, exchange rate and interest rates	The aims of this paper are addressed using heteroscedastic cointegration analysis.
	Results show that the cointegrating relationship does exist between stock prices and the Macroeconomic factors in the highly speculative Chinese stock market. Detailed analysis shows stock market performance is positively related to that of macro-economy in the long term	

Table 2.11: Summary of studies in Relation between Inflation Rate and Stock Market (Continued 2)

No.	Author	Title
	Objective	Methodology
	Finding	
6	Mofleh Ali Mofleh Alshogeathri, (2011)	Macroeconomic determinants of the stock market movements: empirical evidence from the Saudi stock market (TASI)
	This paper investigates the long run and short run relationships between Saudi stock market (TASI) returns and eight Macroeconomic factors, over the period January 1993 to December 2009.	A wide range of Vector autoregression and generalized autoregressive conditional heteroskedasticity models estimated and interpreted.
	The results show that there was a significant negative relationship between interest rate, inflation rate and TASI. In addition, the paper also suggested a positive long relationship between exchange rate and TASI.	

Table 2.12: Summary of the impacts of Macroeconomic variables on Stock Market

No.	Author	Country	Variable	Positive(+)/ Negative(-) to Stock Market
1	Joseph and Vezos, (2006)	USA	Exchange rate	(+)
2	Puah and Jayaraman, (2007)	Fiji	Exchange rate	(-)
3	Adjasi *at el*., (2011)	Tunisia, Ghana, Kenya, Mauritius, Nigeria, Egypt and South Africa	Exchange rate	Tunisia (+), Ghana (+),Kenya (+), Mauritius (+), Nigeria (+), Egypt (-) and South Africa (-)
4	Bhunia, (2012)	India	Exchange rate	(-)
5	Chen and Chen, (2012)	12 OECD countries	Exchange rate	Cannot define
6	Ray, (2012)	Hong Kong, India, Japan, Korea and Singapore	Exchange rate	Cannot define
7	Kim and Huang, (2006)	Hong Kong, Singapore, Japan and United Kingdom	Interest rate	Hong Kong (-), Singapore (-), Japan (-) and United Kingdom(-)
8	Hyde, (2007)	France, Germany, Italy and United Kingdom	Interest rate	France (+), Germany (+), Italy (+) and United Kingdom (+)
9	Adjasi, (2009)	Ghana	Interest rate	(+)
10	Hussainey and Ngoc, (2009)	Vietnam	Interest rate	(-)
11	Majid and Yusof, (2009)	Malaysia	Interest rate	(+)
12	Park and Choi, (2011)	USA	Interest rate	Cannot define
13	Wickremasinghe, (2011)	Sri Lanka	Interest rate	(+)
14	Kim *at el*., (2006)	Singapore, Hong Kong , Japan and United Kingdom	Inflation rate	Singapore (+), Hong Kong (+), Japan (-) and United Kingdom (+)
15	Kim and Shukla, (2006)	World stock index (23 Countries)	Inflation rate	(-)
16	Anthony and Kwame, (2008)	Ghana	Inflation rate	(-)
17	Gay, (2008)	Brazil, Russia, India and China	Inflation rate	(-)
18	Liu and Shrestha, (2008)	China	Inflation rate	(-)
19	Mofleh, (2011)	Saudi Arabia	Inflation rate	(-)

Table 2.12 summarized the impacts of Macroeconomic factors on stock market based on the previous studies included in Table 2.2 – Table 2.11. There are overall 19 previous studies.

CHAPTER 3
RESEARCH FRAMEWORK

Chapter Three includes the following topics: Operationalization of the dependent and independent variables, Conceptual framework and development of hypotheses. Firstly, the operationalization of variables is presented. Next comes the Conceptual framework, the researcher's own model, which explains the independent and dependent variables. Lastly, Research hypotheses, statements specifying the relationships between variables are presented.

3.1 Dependent variables

This study investigates three Macroeconomic factors that all have a significant impact on SET index and SET property development index over the period January 2002 to December 2011. The following section will detail the variables related to this research.

3.1.1 SET index (SETI)

According to Odera (2005), stock market indices, as an aggregate measure, provides information to investors on the market performance by characterizing the development of global markets and specified market segments. Odera (2005) further stated that Index numbers are applied in the measurement of movements at the stock market. An Index number effectively summarizes hundreds of price movements. SET Index is a composite market capitalization-weighted price index which compares the current market value of all listed common stocks with its market value on the base date of April 30, 1975, which was when the SET Index was established. The SET Index was set at 100 points on the Base date.

$$\text{SET Index} = \frac{\text{Current Market Value}}{\text{Base Market Value}} \times 100$$

3.1.2 SET Property Development Index (SETPDI)

The SET index, which is calculated from the prices of all common stocks on the main board, the SET also provides industry group and sectoral indices. Both these types of indices are calculated from the prices of the common stock which share the same basic which

characterize each particular industry group and sector. As a result, SETPDI is one of the sectors in the property and construction industry.

Bloomberg describes SET Property Development Index (http://www.bloomberg.com/quote/SETPROP:IND) as a capitalization-weighted index of all stocks of the SET Index that are involved in the property sector except the property fund securities. The index was developed with a base value of 100 on April 30, 1975 with parent index SET. It consists of 63 members as of 13/09/12.

3.2 Independent Variables

Three independent variables in this study include: exchange rate, Thai Baht to US Dollar (EX); Interest rate, policy rate (PR); Inflation rate in the Thai economy measured by the change of consumer price index comparing to previous year (CCPI) as a representative for the influence of both dependent variables.

3.2.1 Exchange rate: TH Baht to US Dollar Average Selling Rate (EX)

Sullivan and Sheffrin (2003) suggest that exchange rate between two currencies is the rate at which one currency will be exchanged for another. It is also regarded as the equivalent value of one country's currency in terms of another currency. For example, an exchange rate of Thai Baht 30 to the US Dollar 1 means that Thai Baht 30 will be exchanged for each US Dollar 1 or vice versa.

The average exchange rate is the rate that is based on weighted averages of exchange rate for one working day. Normally, there are two types of exchange rates: buying rate and selling rate. Whereby: The buying rate is the rate that the money dealer will buy foreign currency and the selling rate is the rate that the money dealer will sell the currency.

3.2.2 Interest rate: Policy Rate (PR)

Policy rate is an interest rate set by Bank of Thailand (BOT) in order to conduct monetary policy under the inflation-targeting framework; the monetary stance is indicated through the policy rate. According to BOT, the 14-day repurchase rate was used at policy rate up until 16 January 2007, when the policy rate was switched to the 1-day repurchase rate. However, Since 12 February 2008, the policy rate was switched again to the 1-day bilateral repurchase rate.

In Thailand, policy rate is the benchmark of the interest rates. In addition, changes in the policy rate lead to a chain of events that affect loan rate, short-term interest rate, fixed deposit rate, long-term interest rate, the amount of money and credit and related issues.

3.2.3 Inflation rate (CCPI)

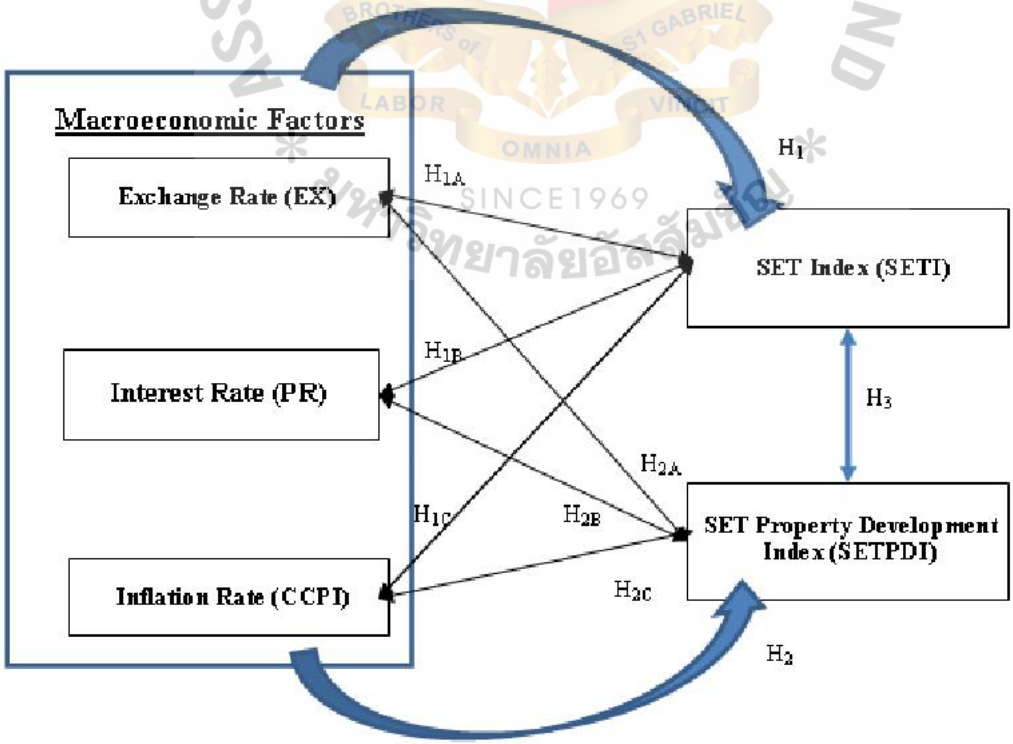
According to Kim *et al.* (2006), inflation rate influences are considered important in financial and real asset pricing. It is commonly estimated by changes in Consumer Price Index (CCPI) which measure the retail prices of several thousand goods and services purchased by consumers.

Sullivan and Sheffrin (2003) define inflation rate as a measure of inflation, or the rate of increase of a price index such as the consumer price index. It is the percentage rate of change in price level over time, usually one year.

3.3 Conceptual Framework

The following diagram shows the conceptual frame work used in this research

Figure 7: Conceptual framework used in this research



3.4 Development of Statistical Hypotheses

This research observes the effects of Macroeconomic factors on SET index and SET Property development index in Thailand Stock Market. In order to achieve the objective of the study, the following hypotheses are developed.

Hypothesis 1: Macroeconomic factors and SET Index

H_{10}: There is no impact of Macroeconomic factors on SET index
H_1: There are impacts of Macroeconomic factors on SET index

H_{1A0}: There is no impact of exchange rate on SET index
H_{1A}: There is an impact of exchange rate on SET index

H_{1B0}: There is no impact of interest rate on SET index
H_{1B}: There is an impact of interest rate on SET index

H_{1C0}: There is no impact of inflation rate on SET index
H_{1C}: There is an impact of inflation rate on SET index

Hypothesis 2: Macroeconomic factors and SET Property Development Index

H_{20}: There is no impact of Macroeconomic factors on SET property development index
H_2: There is an impact of Macroeconomic factors on SET property development index

H_{2A0}: There is no impact of exchange rate on SET property development index
H_{2A}: There is an impact of exchange rate on SET property development index

H_{2B0}: There is no impact of interest rate on SET property development index
H_{2B}: There is an impact of interest rate on SET property development index

H_{2C0}: There is no impact of inflation rate on SET property development index
H_{2C}: There is an impact of inflation rate on SET property development index

Hypothesis 3: SET Index and SET Property Development Index

H_{30}: There is no relationship between SET index and SET property development index
H_3: There is a relationship between SET index and SET property development index

Details related to hypothesis testing will be shown in the following chapter.

CHAPTER 4

RESEARCH METHODOLOGY

This chapter is a presentation of the research methodology used for this study. It consists three sections. The first section explains the procedure used for data collecting. The second section details the handling and treatment of the data. The last section explains the methodology used for analyzing the data.

4.1 Data Collection

Most secondary data for this research were collected from the database provided by SET market analysis and reporting tool (SETSMART), the web-based application from the Stock Exchange of Thailand that can seamlessly integrate comprehensive sources of Thai listed company data including historical stock prices, historical indices, listed company profile and historical news.

Another source of secondary data was the website of the Bank of Thailand (BOT) – BOT was first set up as the Thai National Banking Bureau. The Bank of Thailand Act was promulgated on 28 April 1942 vesting upon the Bank of Thailand the responsibility for all central banking functions. The Bank of Thailand started operations on 10 December 1942.

Last source of secondary data was the website of Bureau of Trade and Economic Indices (http://www.price.moc.go.th/en/Default5.aspx).

4.1.1 SET Index Data Collection

The daily closed prices of SET index were obtained from the SETSMART, ranging from 1 January 2002 to 31 December 2011.

4.1.2 SET Property Development Index Data Collection

The daily closed prices of SET Property Development index were obtained from the SETSMART, covering the period from 1 January 2002 to 31 December 2011.

4.1.3 Exchange Rate (Thai Baht to US Dollar) Data Collection

The daily average selling rates of exchange rate were obtained from the Bank of Thailand's website, covering the period from 1 January 2002 to 31 December 2011.

The researcher selected to use the average selling rate instead of the average buying rate because the average selling rate has higher value than the average buying rate. Moreover, whether using the average selling rate or the spot selling rate, the result of the research will not be much different. Thus, the researcher chose to use the average selling rate in this study.

4.1.4 Interest Rate (Policy Rate) Data Collection

The Monthly interest rates were obtained from the Bank of Thailand's website, ranging from January 2002 to December 2011.

4.1.5 Inflation Rate (Change in Consumer Price Index) Data Collection

The monthly inflation rates were obtained from the website of Bureau of Trade and Economic Indices, covering the period from January 2002 to December 2011.

Table 4.1: Summary of data used in research

Data type	Time Period	Data Source
SET Index (daily)	1 January 2002 to 31 December 2011	SETSMART
SET Property Development Index (daily)	1 January 2002 to 31 December 2011	SETSMART
Exchange Rate (TH Baht to US Dollar Average Selling Rate, daily)	1 January 2002 to 31 December 2011	The Bank of Thailand
Interest Rate (Policy Rate, monthly)	January 2002 to December 2011	The Bank of Thailand
Inflation Rate (Change in Consumer Price Index, monthly)	January 2002 to December 2011	Bureau of Trade and Economic Indices

4.2 Statistical Treatment of Data

This research utilized the computation power of Microsoft Excel 2007 and SAS enterprise master license number 000061031892 to filter data based on hypothesis criteria and analyze.

4.3 Research Models

This study uses Linear Regression model and Multiple Regression model to determine the relationships between both indices (SETI and SETPDI) and three Macroeconomic factors: Exchange rate (EX), Interest rate (PR) and Inflation rate (CCPI). In addition, this study uses Paired t-test to find the relationships between SETI and SETPDI.

4.3.1 Simple Linear Regression Model

To analyze the relationships between each Macroeconomic variable and both indices, this study uses simple linear regression model. Linear regression is an approach to modeling the relationships between the dependent variable and one or more independent variables. The case of one independent variable is called simple linear regression. More than one independent variable is multiple regression (See section 4.3.2). This model was used to examine for Taiwan the casual relationships between index returns and certain crucial Macroeconomic factors namely exchange rate, inflation, employment rate, GDP and money supply by Singh *et al* (2011).

The Linear Regression Models are:

$$SETI = b_0 + b_1 EX + \varepsilon,$$

$$SETI = b_0 + b_1 PR + \varepsilon,$$

$$SETI = b_0 + b_1 CCPI + \varepsilon$$

And

$$SETPDI = b_0 + b_1 EX + \varepsilon,$$

$$SETPDI = b_0 + b_1 PR + \varepsilon,$$

$$SETPDI = b_0 + b_1 CCPI + \varepsilon,$$

Where,

SETI = the price of SET index

SETPDI = the price of SET property development index

EX = the exchange rate

PR = the interest rate

CCPI = the inflation rate

b_0 = the intercept and the coefficient

b_1 = the parameter estimate for the independent variable

ε = the error term

4.3.2 Multiple Regression Model

To analyze the relationships between the selected Macroeconomic factors and both indices, this study uses a macro-econometric model which developed from a modified version of Menike (2006). The original model was used to determine the effect of Macroeconomic factors on stock prices in selected companies in the Colombo Stock Exchange. Thus, based on the model employed by Menike (2006), this study developed the following multiple regression models as:

$$SETI_{it} = \beta_{0i} + \beta_1 EX_{it} + \beta_2 PR_{it} + \beta_3 CCPI_{it} + \beta_4 EX_{it-1} + \beta_5 PR_{it-1} + \beta_6 CCPI_{it-1} + ... + \beta_p EX_{it} - p + \beta_p PR_{it-p} + \beta_p CCPI_{it-p} + \varepsilon_{it}$$

And

$$SETPDI_{it} = \beta_{0i} + \beta_1 EX_{it} + \beta_2 PR_{it} + \beta_3 CCPI_{it} + \beta_4 EX_{it-1} + \beta_5 PR_{it-1} + \beta_6 CCPI_{it-1} + ... + \beta_p EX_{it} - p + \beta_p PR_{it-p} + \beta_p CCPI_{it-p} + \varepsilon_{it}$$

Where,

$SETI_{it}$ = the price of SETI of i^{th} observation at time t

$SETPDI_{it}$ = the price of SETPDI of i^{th} observation at time t

$EX_{i\,t}$ = the exchange rate for observation i at time t

$PR_{i\,t}$ = the interest rate for observation i at time t

$CCPI_{i\,t}$ = the inflation rate for observation i at time t

$EX_{i\,t-1}$ = the exchange rate for observation i at time t - 1

PR_{it-1} = the interest rate for observation i at time t-1

$CCPI_{i\,t-2}$ = the inflation rate for observation i at time t-2

β_{0i} = the intercept of the regression of i^{th} observation

ε_{it} = the error term of regression

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and β_p = the coefficient of variables

The values β_j represent parameters to be estimated. The overall statistical significance of regression is tested through F-test.

4.3.3 Paired t-test Model

To analyze the relationships between SETI and SETPDI, this study uses Paired t-test model. The paired t-test is calculated to take into account the fact that pairs of subjects go together. It is based on the differences between the values of each pair that is one subtracted from the other.

The model of the Paired t-test is as below:

$$t = \frac{\bar{d}}{\frac{s_d}{\sqrt{n}}}$$

Where,

t = t value

d = difference

^{S}d = standard deviation of the difference

n = the number of values in the data

CHAPTER 5

DATA ANALYSIS

This chapter provides empirical result and analysis of findings from research model applied to Thai stock market. The findings include descriptive analysis and hypothesis testing.

5.1 Descriptive Analysis

Table 5.1: The descriptive statistic of SETI

Analysis Variable : SETI				
Mean	Std Dev	Minimum	Maximum	N
683.4871627	195.0208174	305.1900000	1144.14	2446

As shown in Table 5.1, the average of SETI from 2002 to 2011 is 683.49. The standard deviation of SETI is 195.02, which account for 28.53 percent difference from its mean value doesn't show for high volatility of change in SETI. The minimum SETI during the study period falls to 305.19 where as highest SETI of 1144.14 was reached on 1st August 2011. The overall observation is 2446.

Table 5.2: The descriptive statistic of SETPDI

Analysis Variable : SETPDI				
Mean	Std Dev	Minimum	Maximum	N
115.6803393	29.6521891	48.8900000	203.2700000	2446

As shown in Table 5.2, the average of SETPDI from 2002 to 2011 is 115.68. The standard deviation of SETPDI is 29.65, which account for 25.63 percent difference from its mean value doesn't show for high volatility of change in SETPDI. The minimum SETPDI during the study period falls to 48.89 where as highest SETPDI of 203.27 was reached on 5th January 2004. The overall observation is 2446.

Table 5.3: The descriptive statistic of EX

Analysis Variable : EX				
Mean	Std Dev	Minimum	Maximum	N
36.8739441	4.2817460	29.7051000	44.3409000	2446

As shown in Table 5.3, the average of EX from 2002 to 2011 is 36.87 Baht/Dollar. The standard deviation of EX is 4.28, which account for 11.60 percent difference from its mean value show for low volatility of change in EX. The minimum EX during the study period falls to 29.71 Baht/Dollar where as highest EX of 44.34 Baht/Dollar was reached on 2nd January 2002. The overall observation is 2446.

Table 5.4: The descriptive statistic of PR

Analysis Variable : PR				
Mean	Std Dev	Minimum	Maximum	N
2.5405765	1.1830060	1.2500000	5.0000000	2446

As shown in Table 5.4, the average of PR from 2002 to 2011 is 2.54. The high standard deviation of 1.18 for PR, which account for 46.46 percent difference from its mean value, show for high volatility of change in PR. The minimum PR during the study period falls to 1.25 where as highest PR of 5 was reached during the period from 19th June 2006 to 16th January 2007. The overall observation is 2446.

Table 5.5: The descriptive statistic of CCPI

Analysis Variable : CCPI				
Mean	Std Dev	Minimum	Maximum	N
2.8330744	2.2256098	-4.4000000	9.2000000	2446

As shown in Table 5.5, the average of CCPI from 2002 to 2011 is 2.83. The standard deviation of CCPI is 2.23, which account for 78.80 percent difference from its mean value indicates the high volatility of change in CCPI. The minimum CCPI during the study period falls to -4.40 where as highest CCPI of 9.20 was reached in July 2008. The overall observation is 2446.

5.2 Hypothesis Testing

The following are hypotheses used in this research. After transforming raw data into a form that is easy to interpret by using SAS, the data are statistically treated. The results of their testing are as follows.

Table 5.6: Collinearity Statistics

Collinearity Statistics			
Variable	Variance Inflation	Tolerance	Eigenvalue
Intercept	0		
EX	1.04092	0.96069	0.29173
PR	1.34182	0.74525	0.10318
CCPI	1.34500	0.74350	0.00603

Table 5.6 shows the Collinearity Statistics of three independent variables, Multicollinearity describe more than two variables are near perfect linear combinations of one another or it is a statistical phenomenon in which two or more predictor variables in a multiple regression model are highly correlated, and refer to a situation in which two or more explanatory variables in a multiple regression model highly linearly related.

There are three categories of values to be focused: variance inflation factor, tolerance and eigenvalue.

According to O'Brien (2007) a variable whose variance inflation factor values are greater than 10 may deserve further investigation. It provides an index that measures how much the variance of an estimated regression coefficient is increased because of collinearity, and it should not more than 5 or 10 or above because if it is more than 5 or 10 or above, it indicates a multicollinearity problem. In this study, from the table 5.6 all Macroeconomic factors (EX, PR and CCPI) indicated that the variance of inflation factors at lower than 5 which are 1.04, 1.34 and 1.35 respectively, thus, there is very little multicollinearity among independent variables.

Tolerance (1/Variance inflation factor) is used to check on the degree of collinearity. A tolerance values lower than 0.1 is comparable to a variance inflation factor of 10 which mean that the variable could be considered as a linear combination of other independent variables. In this study, from table 5.6 indicated that the tolerance of Macroeconomic factors are higher than 0.7 which are 0.96, 0.75 and 0.74 respectively. The tolerance result indicates that independent variables have no multicollinearity problem.

Eigenvalue is the factor by which eigenvector changes when multiplied by the matrix the eigenvalue of more than or equal to 10 indicates a multicollinearity problem. In this study, table 5.6 indicates that the highest eigenvalue is 0.29. The result confirms that these three independent variables have no multicollinearity problem.

Hypothesis 1: Macroeconomic factors and SET Index

H_{10}: There is no impact of Macroeconomic factors on SET index

H_1: There are impacts of Macroeconomic factors on SET index

Table 5.7: Analysis of Variance (Macroeconomic factors and SETI)

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	52838785	17612928	1071.19	<.0001
Error	2442	40152191	16442		
Corrected Total	2445	92990977			

Table 5.7 shows an analysis of variance. It tested relationships between Macroeconomic factors (EX, PR and CCPI) and SETI.

Source is to look at the breakdown of variance in the outcome variable. These are the categories that will be examined: Model, Error and Corrected Total. The total variance is partitioned into the variance which can be explained by the independent variables (Model) and the variance which is not explained by the independent variables (Error). The Sum of Squares is to determine how well the data series can be fitted to a faction which might helps to explain how the data series was generated. Mean Squares are the sum of squares divided by the corresponding degree of freedom and F value is the mean square model (17612928) divided by the mean residual (16442), yielding F value is 1071.19. Pr > F is the p-value associated with the above F-statistic. It is used in testing the null hypothesis that all of the model coefficients are 0. The table indicates that the significant at <.0001 is less than (.0001<.005), that means the independent variables (EX, PR and CCPI altogether) reliably predict the dependent variable (SETI).

Table 5.8: Overall Model Fit (Macroeconomic factors and SETI)

Root MSE	128.22768	R-Square	0.5682
Dependent Mean	683.48716	Adj R-Sq	0.5677
Coeff Var	18.76080		

R-Square is used as an indicator to test how well a model fits the data. A higher R-Square is better. From Table 5.8, the R-Square value is 0.5682. However, since the value of

R-Square may change with the addition of more variables, the R-Square need to be taken place by the adjusted R-Square in this case. Therefore, the Adjusted R-Square turned out to be 0.5677, which indicates that all the Macroeconomic factors in this multiple regression model are able to explain the variation of the SETI.

Table 5.9: Parameter Estimate (Macroeconomic factors and SETI)

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-607.30836	24.59296	-24.69	<.0001
EX	1	33.17636	0.61792	53.69	<.0001
PR	1	44.44375	2.53924	17.50	<.0001
CCPI	1	-16.04631	1.35131	-11.87	<.0001

The Parameter Estimates are the regression coefficients. The coefficients for each of the variables indicates the amount of change one could expect in SETI given a one-unit change in the value of the variable, given that all other variables in the model are held constant. From table 5.9, there would be expect a increase of 33.18 in the SETI value for every one unit increase in EX; increase of 44.44 in the SETI value for every one unit increase in PR; decrease of 16.05 in the SETI value for every one unit increase in CCPI, assuming that all other variables in the model are held constant.

Table 5.10: Durbin-Watson D test (Macroeconomic factors and SETI)

Durbin-Watson D	0.007
Number of Observations	2446
1st Order Autocorrelation	0.996

Durbin-Watson statistic is used to detect the presence of a relationship between values separated from each other by a given time lag in the residuals from a regression analysis. The value of "D" always lies between 0 and 4. If Durbin-Watson statistic is less than 2, there is evidence of positive serial correlation. Positive serial correlation is serial correlation in which a positive error for one observation increases the chance of a positive error for another observation. This table shows that the value of Durbin-Watson D is 0.007, which means there is evidence of positive serial correlation between Macroeconomic factors and SETI.

The result of hypothesis testing is shown in Table 5.9. The result from the p-value of the t-statistic of all Macroeconomic factors are <.0001, which is lower than 0.05, which

means that the null hypothesis can be rejected at 5% level of significance. Moreover, the direction of the impacts between Macroeconomic factors and SETI is negative as the coefficient of intercept equal -607.31. It can be concluded that there is a negative impact of Macroeconomic factors on SET index.

The formula of the result is:

SETI = -607.31 + 33.18EX + 44.44PR – 16.05CCPI

H_{1A0}: There is no impact of exchange rate on SET index

H_{1A}: There is an impact of exchange rate on SET index

Table 5.11: Analysis of Variance (EX and SETI)

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	47550224	47550224	2557.46	<.0001
Error	2444	45440752	18593		
Corrected Total	2445	92990977			

Table 5.11 shows an analysis of variance. It tested relationships between EX and SETI.

Source is to look at the breakdown of variance in the outcome variable. These are the categories that will be examined: Model, Error and Corrected Total. The total variance is partitioned into the variance which can be explained by the independent variables (Model) and the variance which is not explained by the independent variables (Error). The Sum of Squares is to determine how well the data series can be fitted to a faction which might helps to explain how the data series was generated. Mean Squares are the sum of squares divided by the corresponding degree of freedom and F value is the mean square model (47550224) divided by the mean residual (18593), yielding F value is 2557.46. Pr > F is the p-value associated with the above F-statistic. It is used in testing the null hypothesis that all of the model coefficients are 0. The table indicates that the significance at <.0001 is less than (.0001<.005), that means the independent variable (EX) reliably predict the dependent variable (SETI).

Table 5.12: Overall Model Fit (EX and SETI)

Root MSE	136.35534	R-Square	0.5113
Dependent Mean	683.48716	Adj R-Sq	0.5111
Coeff Var	19.94995		

R-Square is used as an indicator to test how well a model fits the data. A higher R-Square is better. From Table 5.12, the R-Square value is 0.5113, which indicates that EX in this linear regression model be able to explain the variation of the SETI.

Table 5.13: Parameter Estimates (EX and SETI)

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-517.49221	23.90774	-21.65	<.0001
EX	1	32.56986	0.64404	50.57	<.0001

The Parameter Estimates are the regression coefficients. The coefficient for each of the variables indicates the amount of change one could expect in SETI given a one-unit change in the value of the variable. From Table 5.13, an increase of 32.57 in the SETI value for every one unit increase in EX would be expected.

Table 5.14: Durbin-Watson D test (EX and SETI)

Durbin-Watson D	0.006
Number of Observations	2446
1st Order Autocorrelation	0.997

Durbin-Watson statistic is used to detect the presence of a relationship between values separated from each other by a given time lag in the residuals from a regression analysis. The value of "D" always lies between 0 and 4. If Durbin-Watson statistic is less than 2, there is evidence of positive serial correlation. Positive serial correlation is serial correlation in which a positive error for one observation increases the chance of a positive error for another observation. This table shows that the value of Durbin-Watson D is 0.006, that means there is evidence of positive serial correlation between EX and SETI.

The result of hypothesis testing is shown in table 5.13. The result from the p-value of the t-statistic of EX is <.0001, which is lower than 0.05. It means that the null hypothesis can be rejected at 5% level of significance. Moreover, the direction of the impact of EX on SETI

is positive as the coefficient equal 32.57. It can be concluded that there is a positive impact of Exchange rate on SET index.

The formula of the result is:

SETI = -517.49 + 32.57EX

H_{1B0}: There is no impact of interest rate on SET index

H_{1B}: There is an impact of interest rate on SET index

Table 5.15: Analysis of Variance (PR and SETI)

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	290958	290958	7.67	0.0057
Error	2444	92700019	37930		
Corrected Total	2445	92990977			

Table 5.15 shows an analysis of variance. It tested relationships between PR and SETI.

Source is to look at the breakdown of variance in the outcome variable. These are the categories that will be examined: Model, Error and Corrected Total. The total variance is partitioned into the variance which can be explained by the independent variables (Model) and the variance which is not explained by the independent variables (Error). The Sum of Squares is to determine how well the data series can be fitted to a faction which might helps to explain how the data series was generated. Mean Squares are the sum of squares divided by the corresponding degree of freedom and F value is the mean square model (290958) divided by the mean residual (37930), yielding F value is 7.67. Pr > F is the p-value associated with the above F-statistic. It is used in testing the null hypothesis that all of the model coefficients are 0. The table indicates that the significance at 0.0057 is more than (0.0057>.005), that means the independent variable (PR) doesn't reliably predict the dependent variable (SETI).

Table 5.16: Overall Model Fit (PR and SETI)

Root MSE	194.75531	R-Square	0.0031
Dependent Mean	683.48716	Adj R-Sq	0.0027
Coeff Var	28.49436		

R-Square is used as an indicator to test how well a model fits the data. A higher R-Square is better. From Table 5.16, the R-Square value is 0.0031, which indicates that PR in this linear regression model doesn't explain the variation of the SETI.

Table 5.17: Parameter Estimates (PR and SETI)

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	660.05993	9.33025	70.74	<.0001
PR	1	9.22123	3.32938	2.77	0.0057

The Parameter Estimates are the regression coefficients. The coefficient for each of the variables indicates the amount of change one could expect in SETI given a one-unit change in the value of the variable. From Table 5.17, an increase of 9.22 in the SETI value for every one unit increase in PR would be expected.

Table 5.18: Durbin-Watson D test (PR and SETI)

Durbin-Watson D	0.002
Number of Observations	2446
1st Order Autocorrelation	0.997

Durbin-Watson statistic is used to detect the presence of a relationship between values separated from each other by a given time lag in the residuals from a regression analysis. The value of "D" always lies between 0 and 4. If Durbin-Watson statistic is less than 2, there is evidence of positive serial correlation. Positive serial correlation is serial correlation in which a positive error for one observation increases the chance of a positive error for another observation. This table shows that the value of Durbin-Watson D is 0.002, which means there is evidence of positive serial correlation between PR and SETI.

The result of hypothesis testing is shown in Table 5.17. The result from the p-value of the t-statistic of PR is 0.0057, which is lower than 0.05, means that the null hypothesis can be rejected at 5% level of significance. Moreover, the direction of the impact of PR on SETI is positive as the coefficient equal 9.22. It can be concluded that there is a positive impact of Interest rate on SET index.

The formula of the result is:

SETI = 660.06 +9.22PR

H_{1C0}: There is no impact of inflation rate on SET index

H_{1C}: There is an impact of inflation rate on SET index

Table 5.19: Analysis of Variance (CCPI and SETI)

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	2887622	2887622	78.33	<.0001
Error	2444	90103354	36867		
Corrected Total	2445	92990977			

Table 5.19 shows an analysis of variance. It tested relationships between CCPI and SETI.

Source is to look at the breakdown of variance in the outcome variable. these are the categories that will be examined: Model, Error and Corrected Total. The total variance is partitioned into the variance which can be explained by the independent variables (Model) and the variance which is not explained by the independent variables (Error). The Sum of Squares is to determine how well the data series can be fitted to a faction which might helps to explain how the data series was generated. Mean Squares are the sum of squares divided by the corresponding degree of freedom and F value is the mean square model (2887622) divided by the mean residual (36867), yielding F value is 78.33. Pr > F is the p-value associated with the above F-statistic. It is used in testing the null hypothesis that all of the model coefficients are 0. The table indicates that the significance at <.0001 is less than (.0001<.005), that means the independent variables (CCPI) reliably predict the dependent variable (SETI).

Table 5.20: Overall Model Fit (CCPI and SETI)

Root MSE	192.00825	R-Square	0.0311
Dependent Mean	683.48716	Adj R-Sq	0.0307
Coeff Var	28.09244		

R-Square is used as an indicator to test how well a model fits the data. A higher R-Square is better. From Table 5.20, the R-Square value is 0.0311, which indicates that CCPI in this linear regression model doesn't explain the variation of the SETI.

Table 5.21: Parameter Estimates (CCPI and SETI)

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	727.23330	6.28534	115.70	<.0001
CCPI	1	-15.44122	1.74474	-8.85	<.0001

The Parameter Estimates are the regression coefficients. The coefficient for each of the variables indicates the amount of change one could expect in SETI given a one-unit change in the value of the variable. From Table 5.21, a decrease of 15.44 in the SETI value for every one unit increase in CCPI would be expected.

Table 5.22: Durbin-Watson D test (CCPI and SETI)

Durbin-Watson D	0.003
Number of Observations	2446
1st Order Autocorrelation	0.997

Durbin-Watson statistic is used to detect the presence of a relationship between values separated from each other by a given time lag in the residuals from a regression analysis. The value of "D" always lies between 0 and 4. If Durbin-Watson statistic is less than 2, there is evidence of positive serial correlation. Positive serial correlation is serial correlation in which a positive error for one observation increases the chance of a positive error for another observation. This table shows that the value of Durbin-Watson D is 0.003, which means there is evidence of positive serial correlation between CCPI and SETI.

The result of hypothesis testing is shown in table 5.21. The result from the p-value of the t-statistic of CCPI is <.0001, which is lower than 0.05, means that the null hypothesis can be rejected at 5% level of significance. Moreover, the direction of the impacts of CCPI on SETI is negative as the coefficient equals -15.44. It can be concluded that there is a negative impact of inflation rate on SET index.

The formula of the result is:

SETI = 727.23 – 15.44CCPI

Hypothesis 2: Macroeconomic factors and SET Property Development Index

H_{20}: There is no impact of Macroeconomic factors on SET property development index

H_2: There are impacts of Macroeconomic factors on SET property development index

Table 5.23: Analysis of Variance (Macroeconomic factors and SETPDI)

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	207093	69031	86.77	<.0001
Error	2442	1942679	795.52773		
Corrected Total	2445	2149772			

Table 5.23 shows an analysis of variance. It tested relationships between Macroeconomic factors (EX, PR and CCPI) and SETPDI.

Source is to look at the breakdown of variance in the outcome variable. These are the categories that will be examined: Model, Error and Corrected Total. The total variance is partitioned into the variance which can be explained by the independent variables (Model) and the variance which is not explained by the independent variables (Error). The Sum of Squares is to determine how well the data series can be fitted to a faction which might helps to explain how the data series was generated. Mean Squares are the sum of squares divided by the corresponding degree of freedom and F value is the mean square model (69031) divided by the mean residual (795.53), yielding F value is 86.77. Pr > F is the p-value associated with the above F-statistic. It is used in testing the null hypothesis that all of the model coefficients are 0. The table indicates that the significance at <.0001 is less than (.0001<.005), that means the independent variables (EX, PR and CCPI altogether) reliably predict the dependent variable (SETPDI).

Table 5.24: Overall Model Fit (Macroeconomic factors and SETPDI)

Root MSE	28.20510	R-Square	0.0963
Dependent Mean	115.68034	Adj R-Sq	0.0952
Coeff Var	24.38193		

R-Square is used as an indicator to test how well a model fits the data. A higher R-Square is better. From Table 5.24, the R-Square value is 0.0963. However, since the value of R-Square may change with the addition of more variables, the R-Square need to be taken place by the adjusted R-Square in this case. Therefore, the Adjusted R-Square found out to be 0.0952, which indicates that all the Macroeconomic factors in this multiple regression model don't explain the variation of the SETPDI.

Table 5.25: Parameter Estimates (Macroeconomic factors and SETPDI)

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	66.63913	5.40950	12.32	<.0001
EX	1	1.49996	0.13592	11.04	<.0001
PR	1	0.47320	0.55853	0.85	0.3970
CCPI	1	-2.63688	0.29723	-8.87	<.0001

The Parameter Estimates are the regression coefficients. The coefficients for each of the variables indicates the amount of change one could expect in SETPDI given a one-unit change in the value of the variable, given that all other variables in the model are held constant. From Table 5.25, it would be there to expect an increase of 1.50 in the SETPDI value for every one unit increase in EX; increase of 0.47 in the SETPDI value for every one unit increase in PR; decrease of 2.64 in the SETPDI value for every one unit increase in CCPI, assuming that all other variables in the model are held constant.

Table 5.26: Durbin-Watson D test (Macroeconomic factors and SETPDI)

Durbin-Watson D	0.006
Number of Observations	2446
1st Order Autocorrelation	0.996

Durbin-Watson statistic is used to detect the presence of a relationship between values separated from each other by a given time lag in the residuals from a regression analysis. The value of "D" always lies between 0 and 4. If Durbin-Watson statistic is less than 2, there is evidence of positive serial correlation. Positive serial correlation is serial correlation in which a positive error for one observation increases the chance of a positive error for another observation. This table shows that the value of Durbin-Watson D is 0.006 that mean there is evidence of positive serial correlation between Macroeconomic factors and SETI.

The result of hypothesis testing is shown in table 5.25. The result from the p-value of the t-statistic of EX and CCPI are <.0001, which is lower than 0.05, which means that the null hypothesis can be rejected at 5% level of significance. However, the result from the p-value of the t-statistic of PR is 0.3970, which is higher than 0.05, means that the null hypothesis failed to reject at 5% level of significance. Therefore, PR needs to be neglected from this model. Moreover, the direction of the impacts of Macroeconomic factors (EX and CCPI) on SETPDI is positive as the coefficient of intercept equals 66.64. It can be concluded that there are positive impacts of Macroeconomic factors (EX and CCPI) on SET property development index.

The formula of the result is:

SETPDI = 66.64 + 1.50EX – 2.64CCPI

H_{2A0}: There is no impact of exchange rate on SET property development index

H_{2A}: There is an impact of exchange rate on SET property development index

Table 5.27: Analysis of Variance (EX and SETPDI)

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	132241	132241	160.19	<.0001
Error	2444	2017531	825.50375		
Corrected Total	2445	2149772			

Table 5.27 shows an analysis of variance. It tested relationships between EX and SETPDI.

Source is to look at the breakdown of variance in the outcome variable. These are the categories that will be examined: Model, Error and Corrected Total. The total variance is partitioned into the variance which can be explained by the independent variables (Model) and the variance which is not explained by the independent variables (Error). The Sum of Squares is to determine how well the data series can be fitted to a faction which might helps to explain how the data series was generated. Mean Squares are the sum of squares divided by the corresponding degree of freedom and F value is the mean square model (132241) divided by the mean residual (825.50), yielding F value is 160.19. Pr > F is the p-value associated with the above F-statistic. It is used in testing the null hypothesis that all of the model coefficients are 0. The table indicates that the significance at <.0001 is less than

(.0001<.005), that means the independent variables (EX) reliably predict the dependent variable (SETPDI).

Table 5.28: Overall Model Fit (EX and SETPDI)

Root MSE	28.73158	R-Square	0.0615
Dependent Mean	115.68034	Adj R-Sq	0.0611
Coeff Var	24.83705		

R-Square is used as an indicator to test how well a model fits the data. A higher R-Square is better. From Table 5.28, the R-Square value is 0.0615, which indicates that EX in this linear regression model doesn't explain the variation of the SETPDI.

Table 5.29: Parameter Estimates (EX and SETPDI)

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	52.34561	5.03763	10.39	<.0001
EX	1	1.71760	0.13571	12.66	<.0001

The Parameter Estimates are the regression coefficients. The coefficient for each of the variables indicates the amount of change one could expect in SETPDI given a one-unit change in the value of the variable. From Table 5.29, it would be there to expect an increase of 1.72 in the SETPDI value for every one unit increase in EX.

Table 5.30: Durbin-Watson D test (EX and SETPDI)

Durbin-Watson D	0.005
Number of Observations	2446
1st Order Autocorrelation	0.997

Durbin-Watson statistic is used to detect the presence of a relationship between values separated from each other by a given time lag in the residuals from a regression analysis. The value of "D" always lies between 0 and 4. If Durbin-Watson statistic is less than 2, there is evidence of positive serial correlation. Positive serial correlation is serial correlation in which a positive error for one observation increases the chance of a positive error for another observation. This table shows that the value of Durbin-Watson D is 0.005, that means there is evidence of positive serial correlation between EX and SETPDI.

The result of hypothesis testing is shown in Table 5.29. The result from the p-value of the t-statistic of EX is <.0001, which is lower than 0.05, which means that the null hypothesis can be rejected at 5% level of significance. Moreover, the direction of the impact of EX on SETPDI is positive as the coefficient equals 1.72. It can be concluded that there is a positive impact of exchange rate on SET property development index.

The formula of the result is:

SETPDI = 52.35 + 1.72EX

H_{2B0}: There is no impact of interest rate on SET property development index

H_{2B}: There is an impact of interest rate on SET property development index

Table 5.31: Analysis of Variance (PR and SETPDI)

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	28974	28974	33.39	<.0001
Error	2444	2120798	867.75680		
Corrected Total	2445	2149772			

Table 5.31 shows an analysis of variance. It tested relationships between PR and SETI.

Source is to look at the breakdown of variance in the outcome variable. These are the categories that will be examined: Model, Error and Corrected Total. The total variance is partitioned into the variance which can be explained by the independent variables (Model) and the variance which is not explained by the independent variables (Error). The Sum of Squares is to determine how well the data series can be fitted to a faction which might helps to explain how the data series was generated. Mean Squares are the sum of squares divided by the corresponding degree of freedom and F value is the mean square model (28974) divided by the mean residual (867.76), yielding F value is 33.39. Pr > F is the p-value associated with the above F-statistic. It is used in testing the null hypothesis that all of the model coefficients are 0. The table indicates that the significance at <.0001 is less than (.0001<.005), that means the independent variables (PR) reliably predict the dependent variable (SETPDI).

Table 5.32: Overall Model Fit (PR and SETPDI)

Root MSE	29.45771	R-Square	0.0135
Dependent Mean	115.68034	Adj R-Sq	0.0131
Coeff Var	25.46475		

R-Square is used as an indicator to test how well a model fits the data. A higher R-Square is better. From Table 5.32, the R-Square value is 0.0135, which indicates that PR in this linear regression model doesn't explain the variation of the SETPDI.

Table 5.33: Parameter Estimates (PR and SETPDI)

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	123.07320	1.41125	87.21	<.0001
PR	1	-2.90991	0.50358	-5.78	<.0001

The Parameter Estimates are the regression coefficients. The coefficient for each of the variables indicates the amount of change one could expect in SETPDI given a one-unit change in the value of the variable. From Table 5.33, it would be there to expect a decrease of 2.91 in the SETPDI value for every one unit increase in PR.

Table 5.34: Durbin-Watson D test (PR and SETPDI)

Durbin-Watson D	0.005
Number of Observations	2446
1st Order Autocorrelation	0.996

Durbin-Watson statistic is used to detect the presence of a relationship between values separated from each other by a given time lag in the residuals from a regression analysis. The value of "D" always lies between 0 and 4. If Durbin-Watson statistic is less than 2, there is evidence of positive serial correlation. Positive serial correlation is serial correlation in which a positive error for one observation increases the chance of a positive error for another observation. This table shows that the value of Durbin-Watson D is 0.005, which means there is evidence of positive serial correlation between PR and SETPDI.

The result of hypothesis testing is shown in table 5.33. The result from the p-value of the t-statistic of PR is <.0001, which is lower than 0.05, which means that the null hypothesis can be rejected at 5% level of significance. Moreover, the direction of the impact of PR on

SETPDI is negative as the coefficient equal -2.91. It can be concluded that there is a negative impact of interest rate on SET property development index.

The formula of the result is:

SETPDI = 123.07 – 2.91PR

H_{2C0}: There is no impact of inflation rate on SET property development index

H_{2C}: There is an impact of inflation rate on SET property development index

Table 5.35: Analysis of Variance (CCPI and SETPDI)

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	110174	110174	132.02	<.0001
Error	2444	2039598	834.53279		
Corrected Total	2445	2149772			

Table 5.35 shows an analysis of variance. It tested relationships between CCPI and SETPDI.

Source is to look at the breakdown of variance in the outcome variable. These are the categories that will be examined: Model, Error and Corrected Total. The total variance is partitioned into the variance which can be explained by the independent variables (Model) and the variance which is not explained by the independent variables (Error). The Sum of Squares is to determine how well the data series can be fitted to a faction which might helps to explain how the data series was generated. Mean Squares are the sum of squares divided by the corresponding degree of freedom and F value is the mean square model (110174) divided by the mean residual (834.53), yielding F value is 132.01. Pr > F is the p-value associated with the above F-statistic. It is used in testing the null hypothesis that all of the model coefficients are 0. The table indicates that the significance at <.0001 is less than (.0001<.005), that means the independent variables (CCPI) reliably predict the dependent variable (SETPDI).

Table 5.36: Overall Model Fit (CCPI and SETPDI)

Root MSE	28.88828	R-Square	0.0512
Dependent Mean	115.68034	Adj R-Sq	0.0509
Coeff Var	24.97251		

R-Square is used as an indicator to test how well a model fits the data. A higher R-Square is better. From Table 5.36, the R-Square value is 0.0512, which indicates that CCPI in this linear regression model doesn't explain the variation of the SETPDI.

Table 5.37: Parameter Estimates (CCPI and SETPDI)

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	124.22527	0.94565	131.36	<.0001
CCPI	1	-3.01613	0.26250	-11.49	<.0001

The Parameter Estimates are the regression coefficients. The coefficient for each of the variables indicates the amount of change one could expect in SETPDI given a one-unit change in the value of the variable. From Table 5.37, it would be there to expect a decrease of 3.02 in the SETPDI value for every one unit increase in CCPI.

Table 5.38: Durbin-Watson D test (CCPI and SETPDI)

Durbin-Watson D	0.005
Number of Observations	2446
1st Order Autocorrelation	0.996

Durbin-Watson statistic is used to detect the presence of a relationship between values separated from each other by a given time lag in the residuals from a regression analysis. The value of "D" always lies between 0 and 4. If Durbin-Watson statistic is less than 2, there is evidence of positive serial correlation. Positive serial correlation is serial correlation in which a positive error for one observation increases the chance of a positive error for another observation. This table shows that the value of Durbin-Watson D is 0.005, so there is evidence of positive serial correlation between CCPI and SETPDI.

The result of hypothesis testing is shown in Table 5.37. The result from the p-value of the t-statistic of CCPI is <.0001, which is lower than 0.05, so the null hypothesis can be rejected at 5% level of significance. Moreover, the direction of the impact of CCPI on SETPDI is negative as the coefficient equals -3.02. It can be concluded that there is a negative impact of inflation rate on SET property development index.

The formula of the result is:

SETPDI = 124.23 – 3.02CCPI

Hypothesis 3: SET Index and SET Property Development Index

H_{30}: There is no relationship between SET and SET property development index
H_3: There is a relationship between SET and SET property development index

Table 5.39: Paired t-test (SETI and SETPDI)

N	Mean	Std Dev	Std Err	Minimum	Maximum
2446	567.8	174.8	3.5343	249.3	979.8

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
567.8	560.9	574.7	174.8	170.0	179.8

DF	t Value	Pr > |t|
2445	160.66	<.0001

As Table 5.39 indicates, the p value between SETI and SETPDI is <0.0001. This result indicates that the mean of SETI is a statistically significantly different from the mean of SETPDI.

The result of hypothesis testing is shown in Table 5.39. The result from the p-value of the t-statistic of the Paired t-test is <.0001, which is lower than 0.05, that means the null hypothesis can be rejected at 5% level of significance. It can be concluded that there is a relationship between SET index and SET property development index.

CHAPTER 6

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The aim of this chapter is to summarize the findings on this study and provides recommendations based on conclusions.

6.1 Summary of findings and Conclusions

The main objective of this research is to investigate whether Macroeconomic factors individually and/or collectively contribute both SET index and SET property development index. More specifically, this study seeks to examine the impacts of three Macroeconomic factors on both indices over the period of time from January 2002 to December 2011. These Macroeconomic factors are: Exchange rate (EX), Thai Baht to US Dollar; Interest rate, policy rate (PR); Inflation rate in the Thai economy measured by the change of consumer price index comparing to previous year (CCPI).

This study used Linear Regression model and Multiple Regression model to determine the impacts of three Macroeconomic factors: Exchange rate (EX), Interest rate (PR) and Inflation rate (CCPI) on both indices (SETI and SETPDI) and. In addition, Paired t-test was used to find the relationships between SETI and SETPDI.

Based on the first research question, "Do the selected Macroeconomic factors have impacts on SET index? If so, what is the direction of the impacts?", this research found that:

1. There are negative impacts of Macroeconomic factors on SET index.
2. There is a positive impact of Exchange rate on SET index.
3. There is a positive impact of Interest rate on SET index.
4. There is a negative impact of Inflation rate on SET index.

The second research question is "Do the selected Macroeconomic factors have impacts on SET property development index? If so, what is the direction of the impacts?", this research found that:

1. There are positive impacts of Macroeconomic factors on SET property development index.
2. There is a positive impact of Exchange rate on SET property development index.

3. There is a negative impact of Interest rate on SET property development index.

4. There is a negative impact of Inflation rate on SET property development index.

The third research question is "Does the SET property development index have relationships with SET index?", this research found that there is a relationship between SET index and SET property development index. The result of this hypothesis was not surprising because SET property development index is a part of SET index. To compare the result of the impacts of Macroeconomic factors on both indices, the result from multiple regression and simple linear regression showed that the impacts of Macroeconomic factors toward both indices are going in opposite direction (negative for SET index and positive for SET property development index) as well as the impacts of interest rate toward both indices are also going in opposite direction (positive for SET index and negative for SET property development index). However, the result of exchange rate and inflation rate were different. The impacts of exchange rate toward both indices are going in the same direction which is positive that means when exchange rate raises, the value of SET index and SET property development index also increase. Moreover, the result showed that there are negative impacts of inflation rate toward both indices. It means when inflation rate rises, it could lead to decrease in both indices' value or vice versa.

To conclude, Macroeconomic factors had negative impacts on the SET index. Exchange rate was found to be a stronger indicator and interest rate was found to be a weaker indicator. In contrast, Macroeconomic factors had positive impacts on the SET property development index. Inflation rate was found to be a stronger indicator while exchange rate a weaker indicator.

The significance of relationships of exchange rate with both indices was viewed as the most crucial finding of this research. Exchange rate has positive relationships with both SET index and SET property development index. However, from the result of this study, it is found that change in exchange rate has stronger affects on the whole Thai stock market than the other two variables. In the mean time, change in exchange rate also has weaker affects on Thai property stock market than the others.

The finding of this study indicates that Macroeconomic factors are very important for predicting Thai stock market, especially, property stock market.

6.1.1 Summary of Hypotheses

The summary of the nine hypotheses are presented in Table 6.1. The summary of each hypothesis includes the variables, the value of Pr > |t| and whether the null hypothesis was rejected.

Table 6.1: Summaries and outcomes of the nine hypotheses

Hypothesis	Variable	Pr > |t|	Reject H_0	Coefficient	Direction
H_1	EX, PR and CCPI → SETI	< 0.0001	Yes	-607.31	Negative
H_{1A}	EX → SETI	< 0.0001	Yes	32.57	Positive
H_{1B}	PR → SETI	0.0057	Yes	9.22	Positive
H_{1C}	CCPI → SETI	< 0.0001	Yes	-15.44	Negative
H_2	EX, PR and CCPI → SETPDI	< 0.0001	Yes	66.64	Positive
H_{2A}	EX → SETPDI	< 0.0001	Yes	1.72	Positive
H_{2B}	PR → SETPDI	< 0.0001	Yes	-2.91	Negative
H_{2C}	CCPI → SETPDI	< 0.0001	Yes	-3.02	Negative
H_3	SETPDI → SETI	< 0.0001	Yes	x	x

Table 6.1 shows the summaries and outcomes of the hypotheses included in this study. The results from the p-value of the t-statistic of hypotheses are lower than 0.05, which means the null hypotheses can be rejected at 5% level of significance. Therefore, there are impacts of Macroeconomic factors on both indices. In addition to the Table 6.1, the coefficients and the directions of the impacts are shown.

6.2 Implications and Recommendations for further research

The findings of this study provide theoretical implications for future researches. This research emphasized both Indices (SETI and SETPDI), given that both indices are sensitive to Macroeconomic factors. The identification of the significant impact of Macroeconomic factors on stock market confirmed the relationship between them as was found by many previous studies.

The negative and positive impacts of Macroeconomic factors on stock prices found in this study have several practical implications. The exchange rate is clearly the most

influential Macroeconomic factors for Thai stock market, which shows a positive impact on Thai stock market. The implication of this finding is that, for an export dominant economy like Thailand, (exports companies listed on the SET), the currency appreciation has a positive effect on the Thai stock market while the currency appreciation has a negative the stock market for an import dominant economy.

The evidence provides that Thai stock market appears to react positively to interest rates. In other words, the higher interest rates will directly affect the returns on Thai stock market. Therefore, this implies that a certain level of predictability is present in stock market that can be explained through the behavior of the interest rate. One possible explanation for this positive impact is that investors would consider the Thai stock market when the interest rate is high, thus, the money and capital markets in the Thai economy are sustainable on the long-term basis.

The regression results obtained in this study seem to indicate that, similar to several studies, the Thai stock market is negatively related to inflation rate. This finding implies that Thai stock market decline during the inflationary phase. One possible implication of this result is that the Thai stock market is not an effective hedge against inflation. Therefore, investments probably would shift to the real assets from a risky stock market when the inflation rate is very high. An increase in inflation increases the nominal risk-free rate, raising investors' required rate of return.

The results have implications on both local and foreign investors, stock market regulators such as Securities and Exchange Commission, policy makers and stock market analysts. For both local and foreign investors and stock analysts, they could predict the direction of stock market and earn profits. As for stock market regulators, they could take steps to monitor the activities of companies to prevent manipulation of stock prices and get the general public educated on the stock market and encourage them to invest in stocks. Finally, policy makers should be more aware of these Macroeconomic effects on stock market so that they could make their decisions more effectively and accurately.

An important aspect of this study relates to the impacts of Macroeconomic factors on Thai property stock market which can be positive or negative depending on model parameters. Although it is now well recognized that Thai property stock market react to fluctuation in

Macroeconomic factors, the definite prediction of the impacts of Macroeconomic factors on Thai property stock market still remain difficult. However, our results will help local and foreign investors and stock brokers deepen their understanding of their relationships implications in Thai property stock markets. Additionally, policy makers may play a role in influencing the volatility on Thai property stock markets through the use of Macroeconomic policy. Moreover, inflation rate is one of the most important factors affecting Thai property stock market and it might also affect political stability, financial market deregulations, property supply and property prices and alternative investment opportunities.

The findings provide practical implications for stock investors that exchange rates have higher predictive power than other factors for Thai stock market. For property stock, inflation rates have higher predictive power. Therefore, stock investors need to keep an eye on the change of both rates. Moreover, the findings provide practical implications for Academies who would like to research further on this field of study. This study might be useful as a guide for academicians who are interested in doing further studies on Thai stock market. Future researches can be conducted on other industries or sectors in the SET and it is also suggested to include other factors such as GDP, gold price, oil price, unemployment rate and related factors. In the future, academicians who wish to extend this research can increase the number of years in which their researches are carried out. It would also be interesting to find out whether the conclusion drawn from Thai stock market would be applicable to other developing countries like China, Malaysia, Singapore or not.

In the conclusion, some implications of this study are:

1. It may become more difficult to predict stock market on the high volatility of Macroeconomic factors in the short run. In other words, the more volatile the Macroeconomic factors are, the more difficult it is to predict stock market in the Thai economy.

2. Both local and foreign investors in Thai stock market should look at the change of exchange rates, interest rate and inflation rate when structuring portfolios and diversification strategies irrespective of their investing in property stock or any other sector.

3. Financial regulators and policymakers may need to take these Macroeconomic factors into account when formulating economic and financial policies.

The findings and implications of this study are limited to the period from January 2002 to December 2011 for Thai stock market. Covering more Thai stock market's sectors, extending longer sample period, and including other Macroeconomic factors that may potentially affect Thai stock market might provide deeper insight and enhance further analysis and implications of the study in this issue. Lastly, while there are very few studies related to Thai property stock market, the scope and variety of the models examine is still limited. For example, this study has not included the effect of other Macroeconomic factors on property stock market due to lack of sufficiently long historical data for research. Thus, further research can stretch more on developing alternative estimable relationship between Macroeconomic factors and Thai property stock market with other econometric factors other than three Macroeconomic factors included in this study. Other promising aspects that can be done are the international or global implications of the findings and relating them to cross-country differences.

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