STOCK PRICE EFFECT AFTER INCLUSION IN/ EXCLUSION FROM THE STOCK INDEX: EMPIRICAL EVIDENCE FROM THE SET 100 INDEX

By

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ABSTRACT

Many previous studies on the index compositional change events of the U.S. and other stock markets have found that there were positive (negative) abnormal returns for inclusion (exclusion) stocks.

This research study aims to examine the price effect after inclusion/exclusion announcements by using event study methodology focusing on the SET100 Index of the Thai stock market from 2012 to 2016. In addition, the related hypotheses which are efficient market, price-pressures, downward-sloping demand curve, information, and liquidity hypotheses are presented in this paper.

By using Market Model methodology, the results show that there are significantly positive (negative) abnormal returns one day after the announcement of inclusion (exclusion) stocks in the SET100 Index, which is consistent with previous U.S. and other stock market indices.

The results of this study lend support to the price-pressure hypothesis for inclusion stocks as the positive abnormal return is not sustained and fully reverses 6 days after the announcement while the persistence of negative abnormal returns from exclusion stock events supports the downward-sloping demand curve hypothesis.

TABLE OF CONTENTS

LIST OF TABLES

TABLE **Page**

LIST OF FIGURES

FIGURES **Page**

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CHAPTER I - GENERALITIES OF THE STUDY

1.1 Background of the Study

Many stock markets in various countries generally create indices by providing a benchmark of investment to accommodate the issue of derivatives (as the market instrument). The example criteria to calculate the component stocks are market capitalization, the number of share trades of its stock, liquidity and traded value. As these basic components change all the time, the indices have to be reviewed and revised on a periodical basis. Some indices review stock components quarterly and some semi-annually in accordance with changes in the market.

Many researchers studied various aspects resulting from stock revision events such as the price effect, the trading volume effect and also the return volatility. In the developed United States stock market, many researchers identified behaviors and tested hypotheses to explain revision events in the Standard & Poor's (S&P) 500 index. In other stock markets such as the United Kingdom, France, Germany, Japan and other emerging stock markets, researchers have attempted to find evidence of such event impacts.

The index effect is now considered as source of interest to arbitragers and speculators. A strategy of passive investors who focus on the equity index is to buy (or sell) stocks once it is added into (or removed from) the index. To minimize tracking errors which is the variance between the market index return and the fund's investment return, index funds must purchase the added stocks and sell the deleted stocks on the effective date of index compositional changes. The S&P Game (Beneish and Whaley, 1996) stated that the implemented date of index changes occasionally occurs after the announcement date, and the profit makers can possibly buy shares to be added into index upfront and then sell them on the date of implementation to passive investors or index funds.

The price effect from a stock inclusion (exclusion) event has been explained in many empirical studies by using the efficient market hypothesis (EMH), the price-pressure hypothesis (PPH), the downward sloping demand curve (DSDC), the information

content hypothesis (ICH), and the liquidity hypothesis (LH). Moreover, the outcomes also vary in different stock markets and environments.

In many studies in recent years and back to the 1980's, the US stock market found positive (negative) abnormal return from stock inclusion in (exclusion from) the index around the announcement of revision events. In Thailand, previous studies by Cholamas (2005) and Teerapong (2010) also found significant abnormal return around events of SET50 index stock review and revision.

This research paper explores a larger index, the SET100 index in the Thai stock market to study the price impact of included (excluded) stocks in correspondence with the event of index revision announcements. The results from this study can possibly be guidance to private investors or financial institution investors who follow indexed investing strategy, where stock should be attractive to them as measured by its abnormal price performance during the event of its inclusion (exclusion) in the index.

History of Stock Composite Index in Thailand

In 1995, the SET50 Index was established by the Stock Exchange of Thailand (SET). The SET50 Index is the first large-cap index of Thailand which acts as a benchmark for investment in the Thailand stock market. The SET uses large market capitalization weighted, high trading liquidity and other compliance requirements to select the top ranked 50 listed companies, where the SET50 index is calculated from the stock price of the 50 selected stocks. The stocks listed in the SET50 index are reviewed semi-annually in June and December.

After 10 years, in 2005, the SET launched another index called the SET100 Index. The selection criteria, necessary qualifications, methodology and the revision period followed the SET50 Index. In addition, the SET100 Index expanded the top ranked large market capitalizations to 100 listed companies.

SET 100 Index revision process

A review process is periodically conducted of the SET100 index every 6 months by the Stock Exchange of Thailand (SET). In the June review, stock selection based on data covering the period from 1st June in the previous year to 31st May of the current year to reflect the index calculation between July and December of each year. For the

December review, stock selection is based on data covering the period from 1st December of the previous year to 30th November of the current year to reflect the index calculation between January and June of the following year.

The SET Index Committee screens all listed stocks in the SET by following the specific "Selection Criteria for periodic review for the SET100 Index". The top ranked 100 listed companies in terms of highest average daily market capitalization are selected to calculate the SET100 Index.

In mid June (and mid December), the SET announces the list of 100 stocks which will be listed in the SET100 index in the second half (the first half) of each year. The announcement also includes the added and deleted stocks to the stock name list of the SET100 index, and the reserve list, which is securities ranked numbers 101 to 105.

Selection Criteria for Inclusion in the SET100 Index

- Length of time: at least 6 month listed and traded on the Stock Exchange of Thailand
- Trading status: not likely be the delisted stock in accordance with SET regulations, under the delisting process, not in suspended trading period or having a tendency to be suspended
- Market capitalization: top 200 stocks with the largest average daily market capitalization over the past 3 months
- Free-float qualifications: maintain at least 20% of the paid-up capital from the latest data in the index review period.
- Liquidity: the monthly turnover value must more than 50% of the total average monthly turnover value at least 9 out of the 12 months during the evaluation period.

1.2 Statement of the Problem

The "index inclusion/exclusion effect" studied by Harris and Gurel (1986), Shleifer (1986), Lynch and Medenhall (1997), Cooper and Woglom (2003) explained the changes in stock index composition and/or the reasons for share price adjustment when a stock is added to (or deleted from) a market index, which is not supported by the efficient market hypothesis.

Since these changes in index composition cause some investors to adjust their portfolio by rebalancing the shares of affected stocks, and since this information is unlikely to convey the future prospects of specific securities, many researchers have tried to find evidence from such events.

As many studies of stock price effect were conducted in stock markets in developed country markets or emerging markets (S&P500, non-S&P500 and other stock markets), this paper will investigate the price impact in the Thai stock market (SET100 index) to check whether the Thai market is consistent with other markets.

1.3 Research Objectives

According to the methodology of the SET100 composite index, which employs "weighted market capitalization", the paper will examine the stocks that have been included in (excluded from) the SET100 Index

1) To determine whether there is positive (negative) abnormal return from index change announcements in the Thai stock market?
2) To observe the change in price during the post-announcement period of 10 days.

1.4 Research Questions

There is on average 10 trading days' difference between the announcement date (AD) and the effective date (ED) of new stocks in the SET100 index. Many empirical studies in many countries stated that index funds will adjust their portfolio on the ED, and risk arbitragers speculate during the lagging period. This paper argues that abnormal return also can be observed in the Thai stock market, thus, the research questions are as follows:

1) Is there a positive (negative) abnormal return from index change announcements in the SET100?
2) If the abnormal return is observed in the SET100 index, is the price change temporary or sustained during the post-announcement period of 10 days?

1.5 Scope of the Research

This research paper focuses on the announcements of the top 100 ranked large market capitalization stocks in the SET100 index to determine the positive (negative)

abnormal return during the announcement period. The scope of this study is to focus on stocks included in (excluded from) each SET100 index revision during the years 2012-2016.

1.6 Limitations of the Research

This research paper will focus on stock price effect on index revision which does not include other effects from SET100 index revision e.g. volume on trading or liquidity effect. In addition, the paper is limited to the study of recent revisions of the SET100 index (year 2012-2016).

1.7 Significance of the Study

The research paper provides various types of information about the stock price effect on index composition changes e.g. academic and business aspects, which could be employed in future empirical studies in other indices of the Thai stock market and could be applied in real business.

From an academic view, this study provides fresh evidence in recent years of SET100 index composition changes because most of the previous studies in Thailand have focused on the SET50 index. From a business perspective, this study provides information to investors on stock attractiveness after inclusion in (exclusion from) the SET100 index, measured by abnormal price performance during announcement events.

1.8 Definition of Terms

Abnormal return is the excess of the actual return over the expected return of the specific event. (Khotari and Warner, 2006)

Estimation window is the historical trading period that is used to estimate the expected return on a specific asset and event. (MacKinlay, 1997)

Event Study is the methodology to investigate the relevance of a particular event (such as earnings announcements, dividend announcements, stock added to/removed from the index) by measuring the impact on the firm's value of a specific event. (Mitchell and Netter 1994)

Event window is the event period of interest to calculate abnormal returns. This can be the event day itself (announcement day) and also the days around the event (prior-announcement and after-announcement). (MacKinlay, 1997)

Exclusion is the list of stocks which will be removed from the composite index ranked by market weight capitalization. (www.set.or.th)

Inclusion is the list of stocks which will become part of the composite index ranked by market weight capitalization and qualified by necessary specific criteria. (www.set.or.th)

Normal return (or predicted return) can be interpreted as the expected return without conditions on the event taking place. (MacKinlay, 1997)

Stock index (or Stock market index) measures the performance of the overall market, a specific segment or the specific sector performance over time. (Vasavi and Santhosh, 2015)

Price Effect is explained by the price movement impacts or behaviors during index changes for 4 hypotheses: (1) price pressure; (2) downward sloping demand curve; (3) information content; (4) liquidity (Lynch and Mendenhall, 1997)

CHAPTER II - REVIEW OF RELATED LITERATURE AND STUDIES

This chapter presents a review of the related literature regarding the effect of index composition changes.

2.1 Theories Related to the Index Composition Changes

With reference to the Efficient Market Hypothesis, stock prices reflect all available public information. Any purchases (sales) of a high volume of shares will have no impact on price according to Harris and Gural (1986). The revision of the index composition is also public information available to all investors.

However, the index composition change events cause investor reactions in various ways, such as the price effect, the trading volume effect, and also the return volatility effect. Many researchers have studied and revealed the impact of index effects in many hypotheses, such as the Price Pressure Hypothesis (PPH), the Downward Sloping Demand Curve (DSDC) hypothesis, the Information Content Hypothesis (ICH) and the Liquidity Cost Hypothesis (LCH).

This paper focuses on the stock price effect on index composition changes but does not include others effects e.g. volume on trading or the liquidity effect. The main hypotheses are described as follows:

2.1.1 Efficient Market Hypothesis (EMH)

The Efficient Market theory was introduced by Fama (1970) who suggested three categories: strong form EMH, semi-strong form EMH, and weak form EMH.

Strong form efficiency assumes that the security prices fully reflect information from all sources included historical, public and also private information. The result showed that there should not be any significant price effects that result from knowing any information, and no one can earn excess returns on investment.

Semi-strong form efficiency assumes that stock prices fully reflect historical information as well as available public information. This means the current stock prices are quickly affected by new neutral publicly available information. The result

showed that excess returns on investment cannot be achieved using technical and fundamental analysis. Thus, the semi-strong form indicates that non-public information can give an advantage to investors attempting to obtain abnormal returns on investment.

Weak form efficiency assumes that stock prices fully reflect historical publicly available information. This hypothesis is also known as the random walk theory. The result showed that historical information has no relationship with the future stock price. By following weak form efficiency, an excess return on investment cannot be achieved using technical analysis as the movement of the stock price is random and historical information has zero correlation to the future stock price, according to Kendall and Hill (1953).

Regarding the semi-strong form of EMH, the announcement of stock inclusions in /exclusions from the index, if based on recent stock performance, this event should not have any impact on their price on the announcement date or the effective date. In contrast, if the index change event carries any significant information content, it should be reflected in an abnormal return on the announcement day but nothing changes on the effective date.

However, past research in many countries found positive (negative) abnormal returns on and around both the announcement and the effective day associated with stock inclusion in (exclusion from) the index, and also the increase in volume associated with index composition change events. There are several explanations for the abnormal returns and volume resulting from index changes.

2.1.2 Price Pressure Hypothesis (PPH)

The price pressure hypothesis claims that abnormal returns from the index revision are caused by a demand shock which the stock market cannot fully absorb at the current stock price level. PPH assumes that the demand curve is temporarily inelastic. This hypothesis assumes that the demand curve for the stock is downward sloping and the supply of the stock is constant. If stock is added to the index, it will lead to an upward shift in the stock demand curve over a short period of time, consequently increasing the stock price.

Since prices are driven by demand, and the index revision is presumed to be an information-free event (no new information), this hypothesis conflicts with the EMH (Shleifer, 1986). On the other hand, if a stock is excluded from the index, the downward shift in the demand curve will lead to a sudden decrease in stock price as the demand curve is downward sloping.

The significant upward or downward shift of the demand curve is due to investors and index funds rebalancing their stock portfolio. Once investors and index funds have adjusted their portfolios, the demand for those stocks will decrease and the stock price will revert and reflect long-term equilibrium price. It presumes that the positive abnormal return over the rebalancing activity should be offset by the subsequent negative abnormal return.

Harris and Gurel (1996) and Blouin, Raedy, and Shackelford (2000) argued that investors who accommodate demand shifts must be compensated for the transaction costs and portfolio risks that they bear. Compensation is represented as temporary price changes for the affected stocks. Even if the demand curve shifts, the equilibrium value of a stock does not change. After the event, the price will move back to its equilibrium level and stabilize.

2.1.3 Downward-Sloping Demand Curve Hypothesis (DSDC)

This hypothesis is an extended study of the price pressure hypothesis and states that stock securities are not perfect substitutes for each other. If the stocks included in the index do not have perfect substitutes, the rightward shift demand curve of these added stocks will result in higher stock prices. In contrast, a decrease in price of excluded stocks results from the leftward shift of the demand curve.

Investors look at stocks differently because each stock has different firm-specific characteristics. The demand curve will be downward sloping and shift leftward or rightward permanently in the long run until another event shifts the demand curve. This is because the absence of perfect substitutes will reduce arbitrage activity to flatten the demand curve. (Shleifer, 1986)

Shleifer (1986) found permanent abnormal returns from S&P 500 index composition changes between 1976 tand1983 and claimed that the demand shift revealed the

current need for index funds. Because stocks are not perfectly substituted (downward sloping demand curve), the index funds adjust their portfolio by increasing the shares of included stocks. There is higher demand for included stocks causing a permanent shift in the demand curve and stock price accordingly.

Harris and Gurel (1986) mentioned that the demand for index funds reduces the supply of stock shares for other market participants; thus, the inclusions cause increases in market price. In contrast, deletions cause market price decreases.

The DSDC hypothesis assumes that equilibrium prices change permanently from demand curve shifts. Therefore, price reversals are not expected under the DSDC hypothesis as the new price reflects a new equilibrium for security holders.

2.1.4 Information Content Hypothesis (ICH)

The information content hypothesis proposed by Jain (1987) states that the stock included (excluded) information is firm-specific information which affects the stock price. The index inclusion/exclusion information is conveyed and used by analysts to predict higher/lower future earnings and cash flow. The information of stock added to the index will be conveyed as favorably news and can push the stock prices up.

Index revision announcements are regarded as good news on added stocks, and bad news on deleted stocks. Good news (bad news) about a security should suddenly the increase (decrease) the price and can be maintained permanently in an efficient market. (Scholes, 1972)

2.1.5 Liquidity Hypothesis (LH)

The liquidity hypothesis introduced by Amihud and Meldelson (1986), asserts that the stocks included in the index may lead to increased institutional interest. Consequently, the stocks included in an index will enjoy increased liquidity.

Increases in liquidity not only lead to higher value for stocks, but also imply that the trading volume will increase when the liquidity risk premium falls. Because of this, it is easier to sell the stock when it is convenient; this will permanently increase the stock price. In contrast, deleted stocks will have an opposite impact according to Hedge and McDermott (2003).

2.2 Empirical Evidence on Price Effect

2.2.1 U.S. Stock Market – the S&P 500 Index

Many empirical studies have examined the compositional changes in the S&P 500. These studies discovered significant price increases (decreases) for stocks included in (excluded from) the index while the trading volume significantly increases for stocks included in, and excluded from, the index.

Harris and Gurel (1986) found evidence that supports the Price Pressure Hypothesis. They studied stock inclusion in (exclusion from) the index between 1978 and 1983, and also found a significant abnormal price reaction on the announcement date. The authors concluded that the price effect was due to price-pressures generated by large trading volumes around the announcement date. However, the price effect was not permanent as it disappeared a few weeks after the change in index composition.

In contrast, Shleifer (1986) found against the PPH that index addition stocks have a persistent positive price effect. According to his results from the sample period between 1966 and 1983, a significant increase in abnormal returns occurred after announcement day (AD) and the price increase was consistent from AD to at least 10-20 trading days after the effective day (ED).

Jain (1987) studied the index effect from 1977 to 1983 for both stock inclusions and exclusions from the S&P 500 index. He concluded that there is no support for the price pressure hypothesis for inclusions. In contrast, there are significant negative abnormal returns for exclusions.

Chen, Noronha & Singal (2004) claimed that the permanent price effect (DSDC) for stock added to the S&P 500 index was due to investor awareness and a temporary price effect for deleted stocks. After stock is added to the index, analysts pay more attention to the added stocks, so the firms can easily access the capital market and, investors can easily access information. Increased awareness of the company from an addition can make investors expect higher returns because the firm might perform more efficiently due to increased monitoring by investors and analysts.

Cooper and Woglom (2003) studied only addition stocks, and explained that the stock price of added stock in the S&P500 index rose on announcement. It leads stock

returns to become more volatile, and only a fraction of the announcement gains was reversed in the subsequent weeks. The permanent price decline appears not as a result of fundamental changes, which means that news about a firm that is added to the index is not good news in the long run.

2.2.2 Other Stock Markets

In recent years, a number of empirical studies on non-S&P market indices have examined compositional changes, such as the Hang Seng index (Hong Kong), FTSE (UK), Nikkei (Japan), and DAX (Germany). In addition, studies have been conducted in emerging countries such as the SENSEX index (India), and the KLSI index (Malaysia)

Shankar and Randhawa (2006) examined the Hang Seng index in the Hong Kong market and discovered significant positive (negative) abnormal returns for stock additions (deletions) on the announcement date. Within 10 days after, the abnormal return subsequently reversed, which is supported by the price pressure hypothesis.

In addition, other empirical evidence also supports the price pressure hypothesis. Opong and Hamill (1999) examined the effects on share price in the FTSE 100 (UK) during compositional changes between 1984 and 1999. They found abnormal returns occurred before the announcement date and significantly reversed after the effective date.

Liu (2000) studied the price effects from both stock inclusion in, and exclusion from, the Nikkei 500 index (Japan). His paper supported the DSDC hypothesis as the price did not reverse after the compositional change event.

Deininger, Kaserer and Roos (2000) investigated the stock price effects of compositional changes in the DAX index (German) between 1988 and 1997. They found abnormal returns to be significantly positive (negative) on stocks included in (excluded from) DAX. Both reactions seemed to be persistent, as no indication of price reversal was found in the following weeks.

Marisetty (2002) found supporting evidence of stock price effects in the SENSEX index (Bombay, India) resulting from compositional changes between 1986 and 2002. Positive abnormal returns were found for both additions and deletions on

announcement day. One day after the announcement day, the deleted stocks had significant negative abnormal returns and there was a permanent shift in the demand curve and a lower equilibrium in the stock prices.

Joshipura and Janakiramanan (2015) found significant negative price effects for deleted stocks in the NIFTY index (India) on announcement date between 1995 and 2009. In contrast, there is no evidence to support abnormal positive returns resulting from the announcement of added stocks.

Parthasarathy (2010) found supporting evidence of stock price effects in the NIFTY index (India) between 1999 and 2010. Permanent positive abnormal returns for addition stocks were found around the announcement date. Due to information asymmetry, investors perceive stocks added to the Nifty index as signaling the quality of a stock, resulting in significant abnormal returns without much abnormal volume.

Muhammad, Ibrahim, Sufar, & Rahman (2009) investigated the efficiency of the stock market during index compositional changes in the KLSI index (Kuala Lumpur, Malaysia) between 1999 and 2006. They found that the announcement of index changes conveys good news to added stocks while it conveys bad news about deleted stocks. As a result, investors react either positively or negatively in accordance with good news and bad news.

Table 2.1 Empirical Evidences for the effect of index revision announcement

Studied by	Index	Studied period	Hypothesis Supported	Findings
Shleifer (1986)	S&P 500 (U.S.)	1966 - 1983	Downward Sloping Demand Curve Hypothesis (DSDC) for Inclusions and Exclusions	- Significant abnormal return after announcement date - Cumulative average abnormal return persistent at least 10-20 trading days after the effective day
Harris and Gurel (1986)	S&P 500 (U.S.)	1978 - 1983	Price Pressure Hypothesis (PPH) for Inclusions and Exclusions	- Significant abnormal price reaction on the announcement date - Abnormal return disappeared in a few weeks after index compositional changes
Dhillon and Johnson (1991)	S&P 500 (U.S.)	1978-SS	Downward Sloping Demand Curve Hypothesis (DSDC) for Inclusions only	- Price level persisted for sixty days after announcement
Chen, Noronha & Singal (2004)	S&P 500 (U.S.)		Downward Sloping Demand Curve Hypothesis (DSDC) for Inclusions and Price Pressure Hypothesis (PPH) for Exclusions	- DSDC supported inclusions as investors pay more attention to the added stocks - PPH supported exclusions
Opong and Hamill (1999)	FTSE 100 (UK)	1984 - 1999	Price Pressure Hypothesis (PPH)	- Abnormal return happens before announcement date - Abnormal return significant reversed after effective date
Liu (2000)	Nikkei 500 index (Japan)	1991 - 1999	Downward Sloping Demand Curve Hypothesis (DSDC) for Inclusions and Exclusions	- Prices do not reverse even after compositional changes
Deininger, Kaserer and Roos (2000)	DAX index (German)	1988 - 1997	Downward Sloping Demand Curve Hypothesis (DSDC) for Inclusions and Exclusions	- No indication of price reversal found in the following weeks after announcement
Marisetty (2002)	SENSEX index (India)	1986 - 2002	No hypothesis supported for Inclusions and Downward Sloping Demand Curve Hypothesis (DSDC) for Exclusions	- Positive Abnormal returns found on announcement date for both inclusions and exclusions. - DSDC supported Exclusions, significant negative abnormal return found one day after announcement and price persistent at a lower equilibrium price in the long-run
Cooper and Woglom (2003)	S&P 500 (U.S.)		Price Pressure Hypothesis (PPH) for Inclusions only	- Significant abnormal price reaction on the announcement date - Permanent price decline in subsequent week as index changes are not good news in the long-run and not firms fundamental changes

Studied by	Index	Studied period	Hypothesis Supported	Findings
Cholamas (2005)	SET50 index (Thailand)	2001 - 2005	Downward Sloping Demand Curve Hypothesis (DSDC) for Inclusions and Exclusions	- Although there were partial reversals in returns, the total permanent window was still statistically positive for Inclusions and negative for Exclusions
Shankar and Randhawa (2006)	Hang Seng (Hong Kong)		Price Pressure Hypothesis (PPH) for Inclusions and Exclusions	- Significant abnormal returns on announcement date - Abnormal returns reversed for 10 days after announcement
Muhammad, Ibrahim, Sufar, & Rahman (2009)	KLSI index (Malaysia)	1996 - 2006	Information Content Hypothesis (ICH) for Inclusions and Exclusions	- Included conveys good news, while being excluded from the KLSI conveys bad news to investors
Parthasarathy (2010)	NIFTY index (India)	1999 - 2010	Information Content Hypothesis (ICH) for Inclusions only	- Investors perceive stock inclusion as signaling the quality of a stock, resulting in significant abnormal return without much abnormal volume
Teerapong (2010)	SET50 index (Thailand)	2001 - 2008	Downward Sloping Demand Curve Hypothesis (DSDC) for Inclusions and Exclusions	- Abnormal return partially reversed in period after announcement - Significant positive (negative) abnormal return for Inclusions (Exclusions) still present in period after announcement date
Joshipura and Janakiramanan (2015)	NIFTY index (India)	1999 - 2009	Price Pressure Hypothesis (PPH) for Exclusions only	- No evidence of abnormal return for Inclusions on announcement date - Significant negative abnormal return found but not sustained in long-run, abnormal return reversed two days after effective date

Note: The information in Table 2.1 is compiled by the author.

CHAPTER III - RESEARCH METHODOLOGY

This chapter describes the details of the hypotheses developed for this study, the measurement of variables, and the collection of data. In addition, the methodology used in determining the abnormal price effect from sample data which added in (deleted from) SET 100 Index.

3.1 Research Hypotheses

According to the empirical evidence on abnormal returns from index composition change announcements, this paper will investigate the price effects of stock included in (excluded from) the SET100 index in the Thai stock market.

Regarding the semi-strong form of EMH, for stock inclusion in/exclusion from the index, stock prices fully reflect historical information as well as the available public information. Consequently, there should not be any impact on the price on the announcement date. The hypotheses of this paper are as follows:

Stock Inclusions

H_0 : There is no abnormal return resulting from the SET100 index inclusion announcement

H_1 : There is abnormal return resulting from the SET100 index inclusion announcement

Stock Exclusions

H_0 : There is no abnormal return resulting from the SET100 index exclusion announcement

H_1 : There is abnormal return resulting from the SET100 index exclusion announcement

And if the result rejects H_0, can the abnormal return be observed as temporary or persistent in the 10 days after announcement day?

Table 3.1 Two hypotheses for the post-announcement window

Hypotheses		Cumulative Abnormal Returns
if the announcement impacted stock price (reject H_0)		From AD+1 to AD+10
Price Pressure	Stock Inclusions	zero
Price Pressure	Stock Exclusions	zero
Downward Sloping Demand	Stock Inclusions	positive
Downward Sloping Demand	Stock Exclusions	negative

To observe the price effect from the index composition changes, Table 3.1 shows the hypotheses if there are abnormal returns from index revision announcements. To observe the investors' reaction without overlapping between the announcement date and the effective date, a time duration of 10 days after announcement is required to test each hypothesis.

The Price Pressure Hypothesis (PPH) states that any abnormal return is expected to fully reverse or reflect the long-term equilibrium price. The PPH is a temporary price effect, so the cumulative average abnormal return for both inclusions and exclusions should reverse to zero.

In contrast, the Downward Sloping Demand Curve (DSDC) Hypothesis states that the stock price effect is permanent until another event/information occurs. Therefore, the cumulative average abnormal return should be maintained as a positive abnormal return for stock inclusions and persist as negative abnormal returns for stock exclusions.

3.2 Data Collection and Screening

The data collected are from the database of the Stock Exchange of Thailand (SET), SET Market Analysis and Reporting Tool (SETSMART). Due to the limitations of secondary source data, the exact announcement dates before 2012 are not all available.

Thus, the study periods of this paper will cover 4 consecutive years from 2012 to 2016. Table 3.2 shows the history of announcement dates and effective dates of SET100 index revisions for the selected period, which covers 7 revisions.

Table 3.2 History of announcement dates and effective dates of SET100 revisions

Period	Announcement Date (AD)	Effective Date (ED)	ED - AD (trading days)
Jan 1 to Jun 30, 2013	Dec 14, 2012	Jan 2, 2013	11
Jul 1 to Dec 31, 2013	Jun 17, 2013	Jul 2, 2013	10
Jan 1 to Jun 30, 2014	Dec 16, 2013	Jan 2, 2014	10
Jul 1 to Dec 31, 2014	Jun 16, 2014	Jul 2, 2014	11
Jan 1 to Jun 30, 2015	Dec 15, 2014	Jan 5, 2015	12
Jul 1 to Dec 31, 2015	Jun 16, 2015	Jul 2, 2015	11
Jan 1 to Jun 30, 2016	Dec 14, 2015	Jan 4, 2016	13

The variables used in this study are new stocks included in (excluded from) the SET 100 index for each revision and uses the daily closing prices of the SET index as the market proxy for the study period. The data are retrieved from the database of the Stock Exchange of Thailand (www.set.or.th) whereas the daily closing prices of selected stocks have been retrieved from the SETSMART database.

Table 3.3 shows the timeframe of the study period in this research paper. The 130 days estimation period (from AD-140 to AD-11) describe the firm's historical performance which is approximately equal to half year trading days. Also, the 130 days are aligned to the trading frequency of each index revision (semi-annual) by the SET. Moreover, the past event studies of the Thai Stock Market usually used 130 estimation days in the market model method, such as the index composition change announcements studied by Cholamas (2005) and dividend announcements studied by Punsiri (1999). In addition, stock split events from the New York Stock Exchange also used 130 estimation days as the estimation period when studied by Christopher, Lamoureux and Percy (1987).

Table 3.3 Timeframe of the study period

Timeframe	Day (from)	Day (to)
Estimation Period	AD - 140	AD – 11
Pre-announcement window	AD - 10	AD - 1
Announcement Day	AD = 0	
Post-announcement window	AD + 1	AD + 10

From the revision period shown in Table 3.2, a total of 75 stocks that were added to the SET100 index and another 75 stocks were deleted from the SET100 index before the data screening process.

Data Screening Process

Like many previous empirical studies, the researchers have to screen out irrelevant news data in order to capture the effects of only index composition changes. To be a "clean" sample, the data screening process in this paper is performed by employing 4 criteria as follows:

Criteria 1: Eliminate the stocks which have an announcement date that differs from Table 3.2, as the SET made amendments to the stock list after initializing the revision announcement date. If the changed list of stocks is subsequently amended, the pre-announcement period will be shorter than other samples. Table 3.4 shows the list of stocks which are eliminated by criteria 1. The samples size is then reduced to 74 inclusion stocks and 74 exclusion stocks.

Table 3.4 List of stocks which are eliminated by criteria 1

Revision Period	Symbol	Remarks
1H-2015	HEMRAJ	Exclusions due to the free float lower than 20%
1H-2015	IFEC	Inclusions as replacement of HEMRAJ

Criteria 2: Eliminate confounding events such as dividend announcements, stock split events, mergers and acquisitions, and other similar corporate events. To prevent potential contamination, Table 3.5 and Table 3.6 show the list of stocks which are eliminated by criteria 2. The sample size is then reduced to 65 inclusion stocks and 69 exclusion stocks.

Table 3.5 List of Inclusions which are eliminated by criteria 2

Symbol	Revision Period	Date	Confounding Events
CHG	1H-2016	23 Nov 2015	Dividend Announcement
EPG	1H-2016	24 Nov 2015	Dividend Announcement
TASCO	1H-2016	26 Nov 2015	Dividend Announcement
BEAUTY	2H-2015	13 May 2015	Stock Split Announcement
CKP	2H-2015	17 Apr 2015	Stock Split Announcement
WHA	2H-2015	30 Apr 2015	Stock Split Announcement
HANA	1H-2015	27 Nov 2014	Dividend Announcement
DEMCO	2H-2013	04 Jun 2013	Exclude all privileges
VGI	2H-2013	30 May 2013	Dividend Announcement

Table 3.6 List of Exclusions which are eliminated by criteria 2

Symbol	Revision Period	Date	Confounding Events
IFEC	2H-2015	25 Jun 2015	Warrant Announcement
TASCO	1H-2015	27 Nov 2014	Dividend Announcement
MBK	2H-2014	25 Apr 2014	Stock Split Announcement
GSTEL	1H-2014	16 Dec 2013	Notice Pending
MAKRO	1H-2014	09 Oct 2013	Stock Split Announcement

Criteria 3: Eliminate the selected stocks which have historical trading days less than 140 days prior to announcement day, with reference to the estimation period in Table 3.3. To reflect the firm's specific performance of last half-year trading days (aligned with half year trading days of the SET100 stock revision period), Table 3.7 shows the list of stocks which are eliminated by criteria 3. The sample size is then reduced to 60 inclusion stocks and 69 exclusion stocks.

Table 3.7 List of Inclusions which are eliminated by criteria 3 (IPO stocks)

Symbol	Company Name	Revision Period	Date of IPO	Trading days
CBG	Carabao Group PCL	2H-2015	21 Nov 2014	133
BJCHI	Bjc Heavy Industries PCL	2H-2014	28 Nov 2013	130
MEGA	Mega Lifesciences PCL	2H-2014	19 Nov 2013	137
NYT	Namyong Terminal PCL	2H-2014	25 Nov 2013	133
AAV	Asia Aviation PCL	1H-2013	31 May 2012	135

Criteria 4: Eliminate the outlier samples that have raw daily return movement more than +/- 20% (abnormal return more than +/- 15%) during the event window: AD-10 to AD+10. To prevent other news that directly impacts the firm's benefits or disadvantages, Table 3.8 shows the list of stocks which are eliminated by criteria 4. The sample size is then reduced to 58 inclusion stocks and 66 exclusion stocks.

Table 3.8 List of stocks which are eliminated by criteria 4

List of	Revision Period	Symbol	Max	Min	Mean	STD
Inclusions	2H-2015	U	22.31%	-22.31%	1.06%	0.1651
Inclusions	1H-2014	N-PARK	18.23%	-18.23%	-0.87%	0.0907
Exclusions	1H-2016	U	28.77%	-28.77%	-1.37%	0.1925
Exclusions	1H-2015	RS	26.12%	-6.06%	1.82%	0.0674
Exclusions	2H-2014	N-PARK	18.23%	-18.23%	0.00%	0.0999
Remarks: N-PARK changed name to U						

3.3 Methodology

To answer the research question on price effects (abnormal return) for the stocks added to the SET100 index between 2012 and 2016, this paper will rely on the "Event Study Methodology" of Strong (1992) which focused on the announcement date (AD) event. The Market Model Methodology is applied to elaborate the abnormal return as used by Cooper and Woglom (2003).

The abnormal return of each stock is the difference between the actual daily return (using Equation 1) and the predicted return (using Equation 2) which is calculated from the market model on a specific day. In order to calculate the stock unadjusted return, the individual stock price index will be used, and then the SET index is use as a proxy (market portfolio) to calculate the abnormal return (AR_{jt}) as a prediction for each stock (using Equation 3).

$$R_{jt} = \ln \left(\frac{P_{jt}}{P_{jt-1}} \right), \tag{1}$$

where R_{jt} is the actual return of stock j on day t,

P_{jt} is the price of a stock j on the day t,

P_{jt-1} is the price of a stock j on the previous or day t-1.

$$E\left(R_{jt}\right) = \alpha_j + \beta_j R_{mt}, \tag{2}$$

where $E\left(R_{jt}\right)$ is the predicted return,

R_{mt} is the SET index return of each specific day t during the test period,

α_j and β_j these parameters are estimated by using Ordinary Least Squares (OLS) regression in the 130 days estimation period of each individual stock.

The estimation period in this paper is 130 days (AD-140 to AD-11) which is approximately equal to the half year trading days which aligns to the trading frequency of each index revision (semi-annual) by the SET.

The predicted return in Equation 3 will be calculated for the event window which includes the pre-announcement event (AD-10 to AD-1), the announcement date (AD = 0) and also the post-announcement date (AD+1 to AD+10).

$$AR_{jt} = R_{jt} - E\left(R_{jt}\right), \tag{3}$$

where AR_{jt} is abnormal return to a particular security j in a given period t.

To examine the price effect behavior of impacted securities through event time, the Average Abnormal Return for event day t, AAR_t needs to be calculated by using Equation 4.

$$AAR_t = \frac{1}{N}\sum_{t=1}^{N} AR_{jt}\ , \tag{4}$$

where N is the number of sample companies.

For the significance test, this research paper applies the study of Brown and Warner (1980) to estimate cross-sectional variance. The t-statistic to test the hypotheses based on the assumption that it is cross-sectional, independent and identical, and normally distributed can be calculated by Equation 5.

$$t - statistic = \frac{AAR_t}{\sigma_N}, \tag{5}$$

where σ_N is the aggregate of estimated standard deviation of all securities in Equation 6.

$$\sigma_N = \frac{\sqrt{\sum_{i=1}^{N}\sigma_{j,est}^2}}{N}, \tag{6}$$

where $\sigma_{j,est}^2$ is the standard deviation of the difference and is calculated on the basis of differences in returns from day -140 through – 11 in Equation 7.

$$\sigma^2_{j,est} = \frac{1}{128}\sum_{t=-140}^{-11}\left(AR_{jt} - \left(\sum_{t=-140}^{-11}\frac{AR_j}{130}\right)\right)^2, \quad (7)$$

The cumulative average abnormal return over the window is computed by summing the stock's abnormal returns over the window and denoting it $CAAR_{(t1,t2)}$ in Equation 8.

$$CAAR_{(t1,t2)} = \sum_{t=t1}^{t=t2} AAR_t, \quad (8)$$

where $CAAR_{(t1,t2)}$ is the cumulative average abnormal return on time t_1 to t_2.

The significance test for the cumulative average abnormal return based on the assumption that it is cross-sectional, independent and identically and normally distributed can be calculated by using Equation 9.

$$t - statistic = \frac{CAAR_t}{\sigma_N\sqrt{d}}, \quad (9)$$

where d is the number of cumulative days from time t_1 to t_2.

CHAPTER IV - PRESENTATION AND DISCUSSION OF RESULTS

This chapter presents the descriptive analysis of variables. The results of the stock price effects after Inclusion in/Exclusion from the SET100 index are presented and analyzed.

4.1 Data Description and Characteristics

To answer the research question as to whether there is an abnormal return from the SET100 index inclusion/exclusion announcements, market model methodology is applied to calculate the abnormal return. The abnormal return of each sample has to be computed by using Equation 3. The average abnormal return (AAR) in Equation 4 is then divided into 2 sets (one set for Inclusion stocks, the other set for Exclusion stocks), to examine the price effects behavior through the event time (AD-10 to AD+10).

Table 4.1 shows the descriptive data for Inclusions and Exclusions from AD-10 to AD+10. After the announcement date, the daily average actual returns of 58 inclusion stocks show positive returns during AD+1 to AD+3 and AD+7 to AD+9. In contrast, the daily average actual returns of 66 exclusion stocks show as negative returns during the post-announcement period except on AD+7.

The abnormal returns of the inclusions are positive on AD-10, AD-6, AD-5, and AD-1, and are negative on other days of the pre-announcement periods. After the announcement date, the inclusion events provide the highest positive abnormal returns on AD+1, and negative returns on most days of the post announcement period.

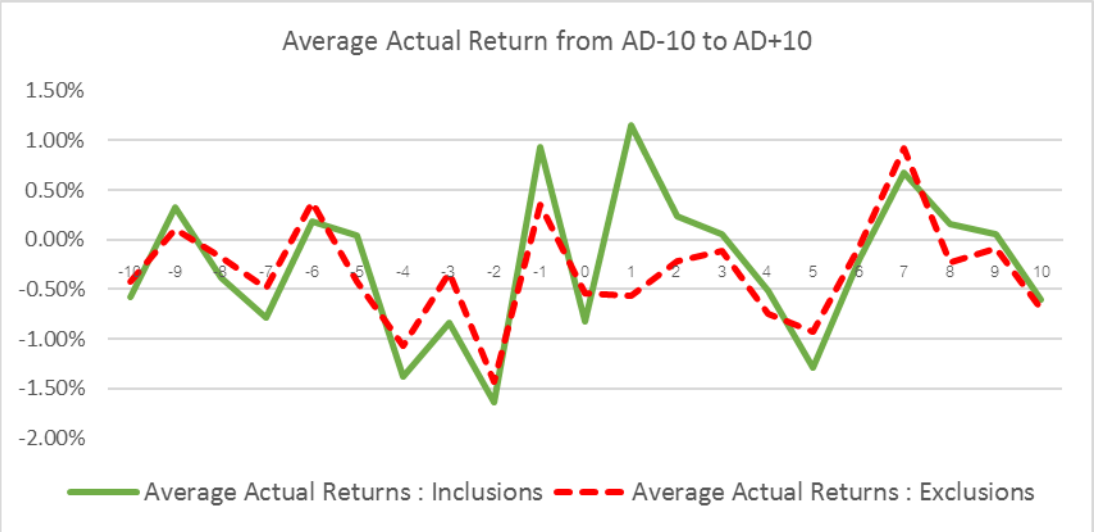
The exclusions provide negative abnormal returns on AD-9, AD-7, AD-5, AD-4 and AD-2. After the announcement date, the exclusion events provide the highest negative abnormal returns on AD+1, and negative returns on most days of the post announcement period.

Table 4.1 Daily Average Data: Actual Returns, Predicted Returns and Abnormal Returns for both Stock Inclusions and Exclusions from AD-10 to AD+10

	Inclusions				Exclusions			
Day	Stocks	Average Actual Returns	Average Predicted Returns	Average Abnormal Returns	Stocks	Average Actual Returns	Average Predicted Returns	Average Abnormal Returns
-10	58	-0.58%	-0.60%	0.02%	66	-0.42%	-0.71%	0.28%
-9	58	0.33%	0.58%	-0.25%	66	0.11%	0.32%	-0.21%
-8	58	-0.39%	-0.32%	-0.07%	66	-0.18%	-0.29%	0.11%
-7	58	-0.78%	-0.10%	-0.68%	66	-0.49%	-0.08%	-0.41%
-6	58	0.18%	0.11%	0.07%	66	0.37%	-0.18%	0.55%
-5	58	0.04%	-0.01%	0.05%	66	-0.42%	-0.27%	-0.16%
-4	58	-1.38%	-1.26%	-0.11%	66	-1.07%	-0.81%	-0.26%
-3	58	-0.84%	-0.79%	-0.05%	66	-0.33%	-0.67%	0.33%
-2	58	-1.64%	-1.26%	-0.38%	66	-1.43%	-0.97%	-0.46%
-1	58	0.93%	0.32%	0.61%	66	0.35%	-0.09%	0.44%
0	58	-0.82%	-0.61%	-0.21%	66	-0.55%	-0.52%	-0.03%
1	58	1.16%	-0.04%	1.19%	66	-0.57%	0.14%	-0.71%
2	58	0.24%	0.47%	-0.24%	66	-0.21%	0.10%	-0.31%
3	58	0.06%	0.14%	-0.08%	66	-0.12%	-0.13%	0.02%
4	58	-0.51%	-0.35%	-0.17%	66	-0.75%	-0.42%	-0.33%
5	58	-1.29%	-0.89%	-0.40%	66	-0.93%	-0.91%	-0.02%
6	58	-0.21%	0.40%	-0.61%	66	-0.08%	0.18%	-0.26%
7	58	0.67%	1.05%	-0.37%	66	0.92%	0.63%	0.29%
8	58	0.15%	0.03%	0.12%	66	-0.23%	-0.10%	-0.12%
9	58	0.06%	0.11%	-0.06%	66	-0.09%	-0.13%	0.05%
10	58	-0.61%	-1.02%	0.41%	66	-0.70%	-1.03%	0.33%

The Figure 1 shows the trend of the daily average actual returns for Stock Inclusion and Exclusion from AD-10 to AD+10. During the pre-announcement period (AD-10 to AD-1), the actual returns for both Inclusions and Exclusions are likely to have the same trend. After announcement from AD+1 to AD+3, the actual returns of Inclusion stocks and Exclusion stocks are not likely to have the same trend. The inclusion stocks have positive actual returns from AD+1 to AD+3 while the exclusion stocks are the opposite

Figure 1 Daily Average Actual Return for Stock Inclusion and Exclusion



4.2 Daily Abnormal Returns

For the semi-strong form of EMH, the stock prices fully reflect historical information as well as the available public information. Consequently, there should not be any impact on their price on the announcement date.

To answer the research question, the following hypotheses have been set:

Stock Inclusions

H_0 : There is no abnormal return from the SET100 index inclusion announcement (Average Abnormal Returns = 0)

H_1 : There is abnormal return from the SET100 index inclusion announcement (Average Abnormal Returns ≠ 0)

Stock Exclusions

H_0 : There is no abnormal return from the SET100 index exclusion announcement (Average Abnormal Returns = 0)

H_1 : There is abnormal return from the SET100 index exclusion announcement (Average Abnormal Returns ≠ 0)

Table 4.2 shows the daily average abnormal returns "AAR" around the announcement date (from AD-10 to AD+10) for the case of stock inclusion, while the results of stock exclusion are shown in Table 4.3. The "N" in Table 4.2 and Table 4.3 represents the

total number of inclusion and exclusion firms (samples), respectively. The number of firms which have actual return more than predicted return are quoted in the "positive" column. In contrast, the "negative" column represents the number of firms which have actual return less than predicted return.

Each table displays the result of daily abnormal return from the market model method. The t-statistic is then executed to determine whether the average abnormal returns are significantly different from zero, represented by *, **, *** at the 90, 95 and 99 percent confidence level, respectively.

Figure 2 plots the daily average abnormal return in a 21 day range (from AD-10 to AD+10) for stock inclusion into the SET100 index, while the stock exclusion samples are displayed in Figure 3.

Table 4.2 Daily Average Abnormal Return for Stock Inclusion

Event Day	N	Positive	Negative	AAR	t-statistic	
Announcement Date (AD = 0)						
AD = -10	58	29	29	0.02%	0.06	
-9	58	25	33	-0.25%	-0.76	
-8	58	26	32	-0.07%	-0.22	
-7	58	23	35	-0.68%	-2.12	**
-6	58	30	28	0.07%	0.23	
-5	58	26	32	0.05%	0.16	
-4	58	25	33	-0.11%	-0.35	
-3	58	28	30	-0.05%	-0.15	
-2	58	29	29	-0.38%	-1.18	
-1	58	36	22	0.61%	1.88	*
AD = 0	58	24	34	-0.21%	-0.65	
+1	58	36	22	1.19%	3.71	***
+2	58	24	34	-0.24%	-0.73	
+3	58	27	31	-0.08%	-0.25	
+4	58	25	33	-0.17%	-0.52	
+5	58	24	34	-0.40%	-1.25	
+6	58	22	36	-0.61%	-1.90	*
+7	58	25	33	-0.37%	-1.16	
+8	58	29	29	0.12%	0.38	
+9	58	24	34	-0.06%	-0.18	
AD = +10	58	32	26	0.41%	1.28	

Average Abnormal Returns are calculated as total abnormal returns of inclusion stocks divided by the sample size
* Significance at 90 Percent Confidence Level
** Significance at 95 Percent Confidence Level
*** Significance at 99 Percent Confidence Level

Figure 2 Daily Average Abnormal Return for Stock Inclusion

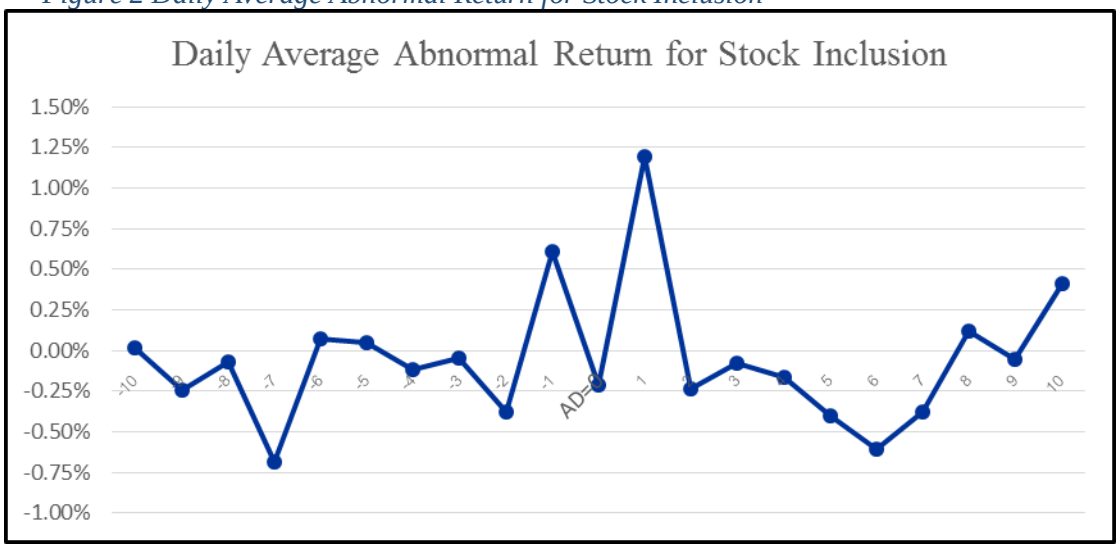
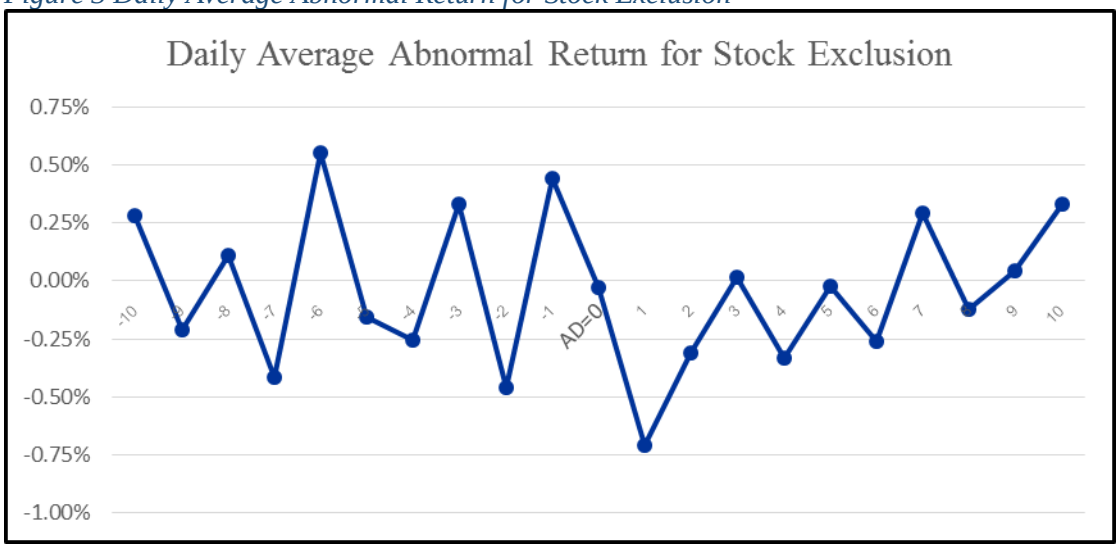


Table 4.3 Daily Average Abnormal Return for Stock Exclusion

Event Day	N	Positive	Negative	AAR	t-statistic	
Announcement Date (AD = 0)						
AD = -10	66	33	33	0.28%	1.12	
-9	66	28	38	-0.21%	-0.84	
-8	66	32	34	0.11%	0.42	
-7	66	27	39	-0.41%	-1.64	
-6	66	39	27	0.55%	2.18	**
-5	66	30	36	-0.16%	-0.62	
-4	66	26	40	-0.26%	-1.02	
-3	66	41	25	0.33%	1.32	
-2	66	31	35	-0.46%	-1.80	*
-1	66	36	30	0.44%	1.74	*
AD = 0	66	25	41	-0.03%	-0.11	
+1	66	22	44	-0.71%	-2.81	***
+2	66	31	35	-0.31%	-1.23	
+3	66	29	37	0.02%	0.06	
+4	66	32	34	-0.33%	-1.31	
+5	66	30	36	-0.02%	-0.09	
+6	66	27	39	-0.26%	-1.02	
+7	66	33	33	0.29%	1.15	
+8	66	23	43	-0.12%	-0.49	
+9	66	34	32	0.05%	0.18	
AD = +10	66	37	29	0.33%	1.31	

Average Abnormal Returns are calculated as total abnormal returns of exclusion stocks divided by the sample size
* Significance at 90 Percent Confidence Level
** Significance at 95 Percent Confidence Level
*** Significance at 99 Percent Confidence Level

Figure 3 Daily Average Abnormal Return for Stock Exclusion



On Announcement Date (AD = 0)

For the inclusion stocks (Table 4.2) on the announcement date, there are 24 stocks which have average actual returns greater than average predicted returns, while 34 stocks have average actual returns less than predicted. The average abnormal returns on the announcement date (AD=0) show insignificant average abnormal returns at -0.21% with a t-statistic of -0.65.

On the other hand, for the exclusion stocks (Table 4.3), the average abnormal returns on the announcement date (AD=0) show insignificant average abnormal returns at -0.03% with a t-statistic of -0.11. Furthermore, 41 of 66 excluded stocks have average actual returns less than average predicted returns.

The insignificance for both inclusion and exclusion samples can be explained by the announcement time. As checked from the Stock Exchange of Thailand (SET) website, for the recent SET100 index revisions, SET announced selective stock lists at the market closing time. Consequently, on the announcement date, investors did not receive the information during trading time.

On One Day after Announcement (AD = +1)

For the inclusion stocks (Table 4.2), one day after the announcement, there are 36 stocks which have average actual returns greater than average predicted returns, while 22 stocks have average actual returns less than predicted. The average abnormal

returns one day after the announcement date shows significant average abnormal returns at +1.19% with a t-statistic of 3.71 (significant at 99% confidence level).

On the other hand, for the exclusion stocks (Table 4.3), the average abnormal returns one day after the announcement shows significant average abnormal returns at -0.71% with a t-statistic of -2.81 (significant at 99% confidence level). 44 of 66 excluded stocks have average actual returns less than average predicted returns.

Both stock inclusion and exclusion samples show average abnormal returns that are significantly different from zero which aligns with the expected direction. The inclusion samples show significantly positive abnormal returns, as the announcement is treated as good news by investors, which leads to demand shock and upward shifts of the demand curve, resulting in stock price increase. On the other hand, the significantly negative abnormal returns for exclusion stocks resulting from investor coveys the announcement as bad news information, consequently the decreasing in stock price.

The results of significantly abnormal return mean H_0 is rejected. There are abnormal returns from the SET100 index inclusions announcement and there are also abnormal returns from the SET100 index exclusions announcement.

4.3 Long Window Statistics for Daily Abnormal Returns

As the announcement on index revision provides significantly abnormal return one day after the announcement (AD=+1), the null hypotheses (H_0) have been rejected. Further studies in this paper aim to observe whether the price change is temporary or persistent for 10 days after the announcement. The cumulative average abnormal return during the post-announcement period is calculated by using Equation 8.

In the post-announcement window, the cumulative average abnormal return (CAAR from AD+1 to AD+10) should become zero if it supports the price pressure hypothesis, and the CAAR from AD+1 to AD+10 should have positive (negative) abnormal returns for inclusion (exclusion) stocks if it supports the downward sloping demand curve hypothesis, the information content hypothesis and the liquidity hypothesis.

Table 4.4 shows the daily average abnormal returns (AAR) and the cumulative average abnormal returns (CAAR) for both inclusion and exclusion stocks in the post-announcement window (AD+10 to AD+10).

Figure 4 and Figure 5 represent the trend of the cumulative average abnormal return in the post-announcement window (AD+1 to AD+10) for stock inclusion and exclusion, respectively.

Table 4.4 Long Window Statistics data in the Post-Announcement window

Event Day	Inclusion Stocks				Exclusion Stocks			
	AAR	CAAR	t-statistic		AAR	CAAR	t-statistic	
AD = +1	1.19%	1.19%	3.71	***	-0.71%	-0.71%	-2.81	***
+2	-0.24%	0.96%	2.11	**	-0.31%	-1.02%	-2.85	***
+3	-0.08%	0.88%	1.58		0.02%	-1.00%	-2.29	**
+4	-0.17%	0.71%	1.11		-0.33%	-1.34%	-2.64	**
+5	-0.40%	0.31%	0.43		-0.02%	-1.36%	-2.40	**
+6	-0.61%	-0.30%	-0.38		-0.26%	-1.62%	-2.61	**
+7	-0.37%	-0.67%	-0.79		0.29%	-1.33%	-1.98	*
+8	0.12%	-0.55%	-0.61		-0.12%	-1.45%	-2.03	**
+9	-0.06%	-0.61%	-0.63		0.05%	-1.41%	-1.85	*
AD = +10	0.41%	-0.19%	-0.19		0.33%	-1.08%	-1.34	

* Significance at 90 Percent Confidence Level

** Significance at 95 Percent Confidence Level

*** Significance at 99 Percent Confidence Level

AAR : Average Abnormal Returns are calculated as total abnormal returns of exclusions stock divided by the sample size

CAAR : Cumulative Average Abnormal Returns from giver

Figure 4 Cumulative Average Abnormal Return (CAAR) for Stock Inclusion from AD=+1 to AD=+10

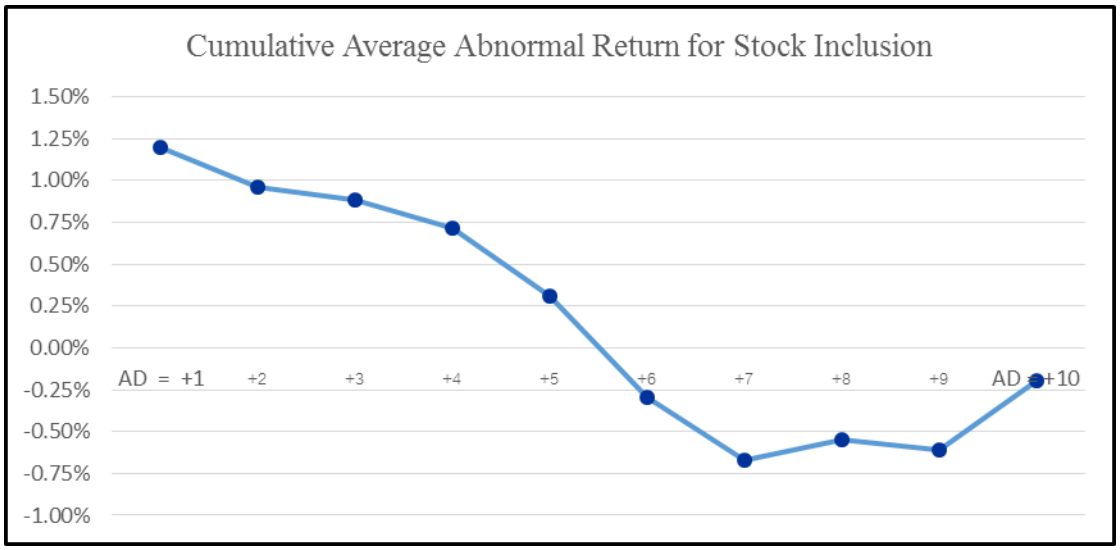
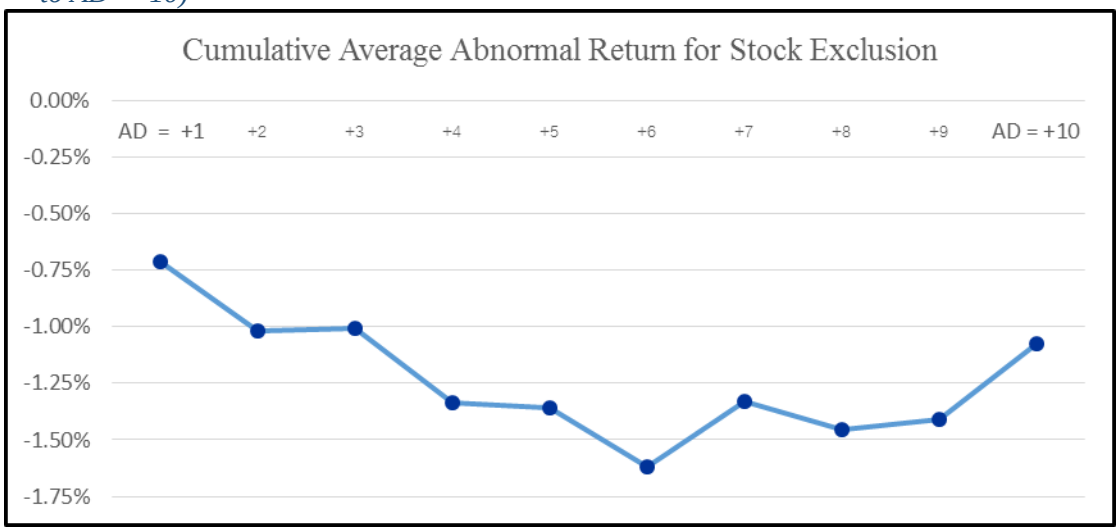


Figure 5 Cumulative Average Abnormal Return (CAAR) for Stock Exclusion from AD=+1 to AD=+10)



Stock Inclusions

From Table 4.4, the cumulative average abnormal return (CAAR) from AD+1 to AD+10, show insignificant abnormal return at -0.19% with a cross-sectional t-statistic of -0.19.

Figure 4 represents the cumulative trend return from AD+1 to AD+10. The chart shows the trend changes moving from +1.19% in one day after the announcement (AD+1) to -0.19% 10 days after the announcement (AD+10).

The results can be explained and supported by the price pressure hypothesis. PPH assumes that the stock price temporarily shifts the demand curve; thus the positive abnormal return should revert to equilibrium. The positive abnormal return from AD+1 disappeared on AD+6 (cumulative return less than zero), and the total return was still lower than zero percent until the last day of the post-announcement period.

Even though the significant positive abnormal returns for Inclusions in AD+1 can be treated as good news to investors, it does not support the information content hypothesis (ICH) as the permanent price decline identifies that the price effect does not result from fundamental changes. News of a firm being added to the index is no longer good news in the long run, Cooper and Woglom (2003).

Stock Exclusions

From Table 4.4, the cumulative average abnormal return (CAAR) from AD+1 to AD+10, show insignificant abnormal return at -1.08% with a cross-sectional t-statistic of -1.34.

Figure 5 represents the cumulative trend return from AD+1 to AD+10. The chart shows the trend changes moving from negative 0.71% on one day after the announcement (AD+1) to negative 1.08% on day 10 after the announcement (AD+10).

The results can be explained and supported by the downward sloping demand curve hypothesis. DSDC assumes that the stock price will move to a new equilibrium level and stay at that level permanently. The abnormal returns on AD+1 show as negative return and persist at a negative level until the last day of the post-announcement period.

Because stocks are not perfectly substituted (downward sloping demand curve), institutional investors and index funds rebalance their portfolio by decreasing shares in excluded stocks. The lower demand from institutional investors and index funds causes the demand curve of excluded stocks to shift leftward. As a result, the lower level of demand leads to a permanently lower stock price.

Moreover, stock exclusions can lead to a decrease in institutional investors and index fund interests which consequently reduces liquidity. The liquidity hypothesis (LH) states that the lower the stock liquidity, the higher the liquidity risk premium. Thus the stocks excluded from the index are not as easy to sell as before, and the lower value of stocks will persist permanently.

CHAPTER V - SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This last chapter provides a summary of results along with the conclusions. The implications are also discussed as well as the recommendations for further study.

5.1 Summary of Results and Conclusions

Many previous event studies investigated the effect of index composition change announcements in developed countries and found significantly positive abnormal returns for stock inclusions in the index and also negative abnormal returns for stock exclusions from the index.

This research study aims to fulfill the research objective to determine the stock price effect after inclusion/exclusion announcements from the SET 100 Index between 2012 and 2016. To answer the research question, this paper investigates the daily average abnormal returns from index change announcements in the Thai stock market as to whether the results are consistent with the price pressure hypothesis, the downward sloping demand hypothesis, the information content hypothesis and the liquidity hypothesis. In addition, this paper determines whether the results are consistent with other stock markets.

Since the Stock Exchange of Thailand (SET) discloses the list of stock additions to /deletions from the SET100 index after the market had closed, the investors cannot see the public information during the market trading time. Therefore, in the Thai stock market (SET100 index) between 2012 and 2016, the results show that there are no abnormal returns from index inclusions and exclusions on the announcement date.

The SET100 index revision announcement drives the market's reaction one day after the announcement. This research results show significant positive abnormal returns 1.19% (significant at 99% confidence level) for stock inclusions to the SET100 Index between 2012 and 2016 and significant negative abnormal returns at 0.71% (significant at 99% confidence level) for stock exclusions from the index.

By looking at the long statistics window, this study supports the price pressure hypothesis (PPH) in the case of stock inclusions while the downward sloping demand curve hypothesis (DSDC), information content hypothesis (ICH) and liquidity hypothesis (LH) apply in the case of stock exclusions.

During the 10 day post-announcement window, the abnormal return for stock inclusions in the SET100 index between 2002 and 2006 partially reverse from day 2 to day 5 and AAR significantly fully reverses on day 6 after the announcement at negative 0.61%. These findings are consistent with the Hong Kong (Hang Seng) stock market and some empirical studies in the U.S. market (S&P500 index) that support the price pressure hypothesis for Inclusions.

In contrast, the stock exclusions from the SET100 index between 2002 and 2006 supports the downward sloping demand curve hypothesis. The negative abnormal returns after the exclusion announcement is persistent at a negative level until the end of the post-announcement window. This finding is consistent with non-S&P 500 indices such as the Nikkei index in Japan and the DAX index in Germany. Because the exclusion of stocks is perceived as bad news for investors and it is less interesting to index funds or institutional investors as the decrease in demand can lead to stock price decrease permanently.

5.2 Implications

This study provides fresh academic evidence about stock inclusion in (exclusion from) the SET 100 index between 2012 and 2016. The value of this research is the enlarged number of sample stocks from stocks included or excluded from the top 50 ranked to those included and excluded from the top 100 ranked in terms of large market capitalization listed in the Thai stock market.

The results of abnormal returns from index composition change announcements in the Thai Stock index (SET100 index) are consistent with much previous international evidence as well as previous Thai evidence (SET50 index).

Based on the specific ground rules of the selection criteria for inclusion in the SET100 Index disclosed by the Stock Exchange of Thailand, institutional investors and analysts, who have information advantages over individual investors, can use the

firm's public information to analyze stock performance in advance of the Stock Exchange of Thailand's announcement.

By analyzing the bulk of data, speculators and institutional investors can predict the list of stocks to be added or removed from the index and can also use historical information to predict the announcement date.

Individual investors and institutional investors can obtain benefits from this study by predicting the trend of stock prices from the index revision change announcement event and by rebalancing their portfolio. Excess return can be achieved by buying the forecasted inclusion stocks and selling them after the index composition change announcement. In contrast, significant losses can be eliminated if speculators sell the forecasted exclusion stocks before the index composition change announcement.

5.3 Recommendations for Future Research

This research paper investigated the price effect of index composition change announcements between 2012 and 2016 in the Stock Exchange of Thailand (SET100 index). The result from this paper cannot be used as a standard for other periods of study or other markets, as the different data and market might lead to different results.

Further study about price effects resulting from stock inclusion/exclusion announcements can be expanded to a longer study period in order to determine the price effects in the long-run, or after stocks are included in the revised index. In addition, the index composition changes can also be studied in other ways, such as trading volume or liquidity effect. These studies could provide benefits to investors in the future.

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APPENDICES

Appendix A. List of Stock Inclusions in SET 100 index during 2012-2016

No.	Revision Period	Symbol	Company Name	Sector	Data Screening
1	1H-2016	BLA	Bangkok Life Assurance Plc.	Insurance	
2	1H-2016	CHG	Chularat Hospital Plc.	Health Care Services	Criteria 2
3	1H-2016	EPG	Eastern Polymer Group Plc.	Construction Materials	Criteria 2
4	1H-2016	GL	Group Lease Plc.	Finance and Securities	
5	1H-2016	GPSC	Global Power Synergy Plc.	Energy & Utilities	
6	1H-2016	PLANB	Plan B Media Plc.	Media & Publishing	
7	1H-2016	PLAT	The Platinum Group Plc.	Property Development	
8	1H-2016	PTG	Ptg Energy Plc.	Energy & Utilities	
9	1H-2016	SAMTEL	Samart Telcoms Plc.	Information & Communication Technology	
10	1H-2016	SCCC	Siam City Cement Plc.	Construction Materials	
11	1H-2016	SCN	Scan Inter Plc.	Energy & Utilities	
12	1H-2016	TASCO	Tipco Asphalt Plc.	Construction Materials	Criteria 2
13	1H-2016	VNG	Vanachai Group Plc.	Construction Materials	
14	1H-2016	WORK	Workpoint Entertainment Plc.	Media & Publishing	
15	2H-2015	ASP	Asia Plus Securities Plc.	Finance and Securities	
16	2H-2015	BA	Bangkok Airways Plc.	Transportation & Logistics	
17	2H-2015	BEAUTY	Beauty Community Plc.	Commerce	Criteria 2
18	2H-2015	CBG	Carabao Group Plc.	Food and Beverage	Criteria 3
19	2H-2015	CKP	Ck Power Plc.	Energy & Utilities	Criteria 2
20	2H-2015	LHBANK	Lh Financial Group Plc.	Banking	
21	2H-2015	MONO	Mono Technology Plc.	Media & Publishing	
22	2H-2015	RS	Rs Plc.	Media & Publishing	
23	2H-2015	S	Singha Estate Plc.	Property Development	
24	2H-2015	SAPPE	Sappe Plc.	Food and Beverage	
25	2H-2015	U	U City Plc.	Property Development	Criteria 4
26	2H-2015	UNIQ	Unique Engineering And Construction Plc.	Property Development	
27	2H-2015	WHA	Wha Corporation Plc.	Property Development	Criteria 2
28	1H-2015	ANAN	Ananda Development Plc.	Property Development	
29	1H-2015	DEMCO	Demco Plc.	Energy & Utilities	
30	1H-2015	HANA	Hana Microelectronics Plc.	Electronic Components	Criteria 2
31	1H-2015	ICHI	Ichitan Group Plc.	Food and Beverage	

32	1H-2015	KTIS	Kaset Thai International Sugar Corporation Plc.	Food and Beverage	
No.	**Revision Period**	**Symbol**	**Company Name**	**Sector**	**Data Screening**
33	1H-2015	PTG	Ptg Energy Plc.	Energy & Utilities	
34	1H-2015	SAWAD	Srisawad Power 1979 Plc.	Finance and Securities	
35	1H-2015	SF	Siam Future Development Plc.	Property Development	
36	1H-2015	SGP	Siamgas And Petrochemicals Plc.	Energy & Utilities	
37	1H-2015	SIM	Samart I-Mobile Plc.	Information & Communication Technology	
38	1H-2015	IFEC	Inter Far East Engineering Plc.	Home & Office Products	Criteria 1
39	2H-2014	BJCHI	Bjc Heavy Industries Plc.	Construction Services	Criteria 3
40	2H-2014	EARTH	Energy Earth Plc.	Energy & Utilities	
41	2H-2014	M	Mk Restaurant Group Plc.	Food and Beverage	
42	2H-2014	MC	Mc Group Plc.	Commerce	
43	2H-2014	MEGA	Mega Lifesciences Plc.	Commerce	Criteria 3
44	2H-2014	NOK	Nok Airlines Plc.	Transportation & Logistics	
45	2H-2014	NYT	Namyong Terminal Plc.	Transportation & Logistics	Criteria 3
46	2H-2014	PSL	Precious Shipping Plc.	Transportation & Logistics	
47	2H-2014	THREL	Thaire Life Assurance Plc.	Insurance	
48	1H-2014	ASP	Asia Plus Securities Plc.	Finance and Securities	
49	1H-2014	BMCL	Bangkok Metro Plc.	Transportation & Logistics	
50	1H-2014	CHG	Chularat Hospital Plc.	Health Care Services	
51	1H-2014	ERW	The Erawan Group Plc.	Tourism & Leisure	
52	1H-2014	GFPT	Gfpt Plc.	Agribusiness	
53	1H-2014	JMART	Jay Mart Plc.	Information & Communication Technology	
54	1H-2014	N-PARK	Natural Park Plc.	Property Development	Criteria 4
55	1H-2014	SVI	Svi Plc.	Electronic Components	
56	1H-2014	TASCO	Tipco Asphalt Plc.	Construction Materials	
57	1H-2014	TFD	Thai Factory Development Plc.	Property Development	
58	1H-2014	TICON	Ticon Industrial Connection Plc.	Property Development	
59	2H-2013	GOLD	Golden Land Property Development Plc.	Property Development	
60	2H-2013	MBK	Mbk Plc.	Property Development	
61	2H-2013	SRICHA	Sriracha Construction Plc.	Property Development	
62	2H-2013	UV	Univentures Plc.	Property Development	
63	2H-2013	WHA	Wha Corporation Plc.	Property Development	
64	2H-2013	DEMCO	Demco Plc.	Energy & Utilities	Criteria 2
65	2H-2013	MDX	M.D.X. Plc.	Energy & Utilities	

No.	Revision Period	Symbol	Company Name	Sector	Data Screening
66	2H-2013	MCOT	Mcot Plc.	Media & Publishing	
67	2H-2013	RS	Rs Plc.	Media & Publishing	
68	2H-2013	VGI	Vgi Global Media Plc.	Media & Publishing	Criteria 2
69	2H-2013	KCE	Kce Electronics Plc.	Electronic Components	
70	1H-2013	THRE	Thai Reinsurance Plc.	Insurance	
71	1H-2013	SSI	Sahaviriya Steel Industries Plc.	Steel	
72	1H-2013	ROJNA	Rojana Industrial Park Plc.	Property Development	
73	1H-2013	SPCG	Spcg Plc.	Energy & Utilities	
74	1H-2013	WORK	Workpoint Entertainment Plc.	Media & Publishing	
75	1H-2013	AAV	Asia Aviation Plc.	Transportation & Logistics	Criteria 3

Appendix B. List of Stock Exclusions in SET 100 index during 2012-2016

No.	Revision Period	Symbol	Company Name	Sector	Data Screening
1	1H-2016	ASP	Asia Plus Securities Plc.	Finance and Securities	
2	1H-2016	DEMCO	Demco Plc.	Energy & Utilities	
3	1H-2016	ERW	The Erawan Group Plc.	Tourism & Leisure	
4	1H-2016	GFPT	Gfpt Plc.	Agribusiness	
5	1H-2016	GLOBAL	Siam Global House Plc.	Commerce	
6	1H-2016	LOXLEY	Loxley Plc.	Commerce	
7	1H-2016	MC	Mc Group Plc.	Commerce	
8	1H-2016	MONO	Mono Technology Plc.	Media & Publishing	
9	1H-2016	PSL	Precious Shipping Plc.	Transportation & Logistics	
10	1H-2016	RATCH	Ratchaburi Electricity Generating Holding Plc.	Energy & Utilities	
11	1H-2016	SAPPE	Sappe Plc.	Food and Beverage	
12	1H-2016	SF	Siam Future Development Plc.	Property Development	
13	1H-2016	SGP	Siamgas And Petrochemicals Plc.	Energy & Utilities	
14	1H-2016	U	U City Plc.	Property Development	Criteria 4
15	2H-2015	BAY	Bank Of Ayudhya Plc.	Banking	
16	2H-2015	BCH	Bangkok Chain Hospital Plc.	Health Care Services	
17	2H-2015	BIGC	Big C Supercenter Plc.	Commerce	
18	2H-2015	BJC	Berli Jucker Plc.	Commerce	
19	2H-2015	IFEC	Inter Far East Engineering Plc.	Home & Office Products	Criteria 2
20	2H-2015	KTIS	Kaset Thai International Sugar Corporation Plc.	Food and Beverage	
21	2H-2015	MEGA	Mega Lifesciences Plc.	Commerce	
22	2H-2015	NOK	Nok Airlines Plc.	Transportation & Logistics	
23	2H-2015	PTG	Ptg Energy Plc.	Energy & Utilities	
24	2H-2015	SCCC	Siam City Cement Plc.	Construction Materials	
25	2H-2015	SIM	Samart I-Mobile Plc.	Information & Communication Technology	
26	2H-2015	STA	Sri Trang Agro-Industry Plc.	Agribusiness	
27	2H-2015	THREL	Thaire Life Assurance Plc.	Insurance	
28	1H-2015	BLA	Bangkok Life Assurance Plc.	Insurance	
29	1H-2015	DCC	Dynasty Ceramic Plc.	Construction Materials	
30	1H-2015	ESSO	Esso (Thailand) Plc.	Energy & Utilities	
31	1H-2015	MCOT	Mcot Plc.	Media & Publishing	
32	1H-2015	NYT	Namyong Terminal Plc.	Transportation & Logistics	

No.	Revision Period	Symbol	Company Name	Sector	Data Screening
33	1H-2015	RS	Rs Plc.	Media & Publishing	Criteria 4
34	1H-2015	SRICHA	Sriracha Construction Plc.	Property Development	
35	1H-2015	TASCO	Tipco Asphalt Plc.	Construction Materials	Criteria 2
36	1H-2015	THRE	Thai Reinsurance Plc.	Insurance	
37	1H-2015	WHA	Wha Corporation Plc.	Property Development	
38	1H-2015	HEMRAJ	Hemaraj Land And Development Plc.	Property Development	Criteria 1
39	2H-2014	ASP	Asia Plus Securities Plc.	Finance and Securities	
40	2H-2014	CHG	Chularat Hospital Plc.	Health Care Services	
41	2H-2014	JMART	Jay Mart Plc.	Information & Communication Technology	
42	2H-2014	MBK	Mbk Plc.	Property Development	Criteria 2
43	2H-2014	N-PARK	Natural Park Plc.	Property Development	Criteria 4
44	2H-2014	TFD	Thai Factory Development Plc.	Property Development	
45	2H-2014	SC	Sc Asset Corporation Plc.	Property Development	
46	2H-2014	SF	Siam Future Development Plc.	Property Development	
47	2H-2014	SSI	Sahaviriya Steel Industries Plc.	Steel	
48	1H-2014	DEMCO	Demco Plc.	Energy & Utilities	
49	1H-2014	GOLD	Golden Land Property Development Plc.	Property Development	
50	1H-2014	GSTEL	G Steel Plc.	Steel	Criteria 2
51	1H-2014	MAKRO	Siam Makro Plc.	Commerce	Criteria 2
52	1H-2014	MALEE	Malee Sampran Plc.	Food and Beverage	
53	1H-2014	MDX	M.D.X. Plc.	Energy & Utilities	
54	1H-2014	PF	Property Perfect Plc.	Property Development	
55	1H-2014	ROJNA	Rojana Industrial Park Plc.	Property Development	
56	1H-2014	SAMTEL	Samart Telcoms Plc.	Information & Communication Technology	
57	1H-2014	SAT	Somboon Advance Technology Plc.	Automotive	
58	1H-2014	TVO	Thai Vegetable Oil Plc.	Food and Beverage	
59	2H-2013	AJ	A.J. Plast Plc.	Packaging	
60	2H-2013	GFPT	Gfpt Plc.	Agribusiness	
61	2H-2013	KSL	Khon Kaen Sugar Industry Plc.	Food and Beverage	
62	2H-2013	LANNA	The Lanna Resources Plc.	Energy & Utilities	
63	2H-2013	PTL	Polyplex (Thailand) Plc.	Packaging	
64	2H-2013	RML	Raimon Land Plc.	Property Development	
65	2H-2013	SGP	Siamgas And Petrochemicals Plc.	Energy & Utilities	
66	2H-2013	SVI	Svi Plc.	Electronic Components	

No.	Revision Period	Symbol	Company Name	Sector	Data Screening
67	2H-2013	TASCO	Tipco Asphalt Plc.	Construction Materials	
68	2H-2013	TICON	Ticon Industrial Connection Plc.	Property Development	
69	2H-2013	WORK	Workpoint Entertainment Plc.	Media & Publishing	
70	1H-2013	ASP	Asia Plus Securities Plc.	Finance and Securities	
71	1H-2013	HANA	Hana Microelectronics Plc.	Electronic Components	
72	1H-2013	KBS	Khonburi Sugar Plc.	Food and Beverage	
73	1H-2013	KGI	Kgi Securities (Thailand) Plc.	Finance and Securities	
74	1H-2013	LHBANK	Lh Financial Group Plc.	Banking	
75	1H-2013	MCOT	Mcot Plc.	Media & Publishing	

Appendix C. Descriptive Statistic of Daily Average Data for Inclusions and Exclusions in SET100 index during 2012-2016

Inclusions	Average Data	Stocks	Days	Mean	SD	Min	Max
Pre-announcement (AD-10 to AD-1)	Actual Returns	58	10	-0.41%	0.0080	-1.64%	0.93%
	Predicted Returns	58	10	-0.33%	0.0063	-1.26%	0.58%
	Abnormal Returns	58	10	-0.08%	0.0033	-0.68%	0.61%
Post-announcement (AD+1 to AD+10)	Actual Returns	58	10	-0.03%	0.0068	-1.29%	1.16%
	Predicted Returns	58	10	-0.01%	0.0062	-1.02%	1.05%
	Abnormal Returns	58	10	-0.02%	0.0051	-0.61%	1.19%
Total Event Window (AD-10 to AD+10)	Actual Returns	58	21	-0.25%	0.0074	-1.64%	1.16%
	Predicted Returns	58	21	-0.19%	0.0062	-1.26%	1.05%
	Abnormal Returns	58	21	-0.06%	0.0041	-0.68%	1.19%
Exclusions	**Average Data**	**Stocks**	**Days**	**Mean**	**SD**	**Min**	**Max**
Pre-announcement (AD-10 to AD-1)	Actual Returns	66	10	-0.35%	0.0057	-1.43%	0.37%
	Predicted Returns	66	10	-0.37%	0.0040	-0.97%	0.32%
	Abnormal Returns	66	10	0.02%	0.0037	-0.46%	0.55%
Post-announcement (AD+1 to AD+10)	Actual Returns	66	10	-0.27%	0.0052	-0.93%	0.92%
	Predicted Returns	66	10	-0.17%	0.0050	-1.03%	0.63%
	Abnormal Returns	66	10	-0.11%	0.0031	-0.71%	0.33%
Total Event Window (AD-10 to AD+10)	Actual Returns	66	21	-0.32%	0.0053	-1.43%	0.92%
	Predicted Returns	66	21	-0.28%	0.0045	-1.03%	0.63%
	Abnormal Returns	66	21	-0.04%	0.0033	-0.71%	0.55%