THE DYNAMIC RELATIONSHIP BETWEEN LTF MUTUAL FUND FLOW AND STOCK MARKET RETURN: EVIDENCE FROM THAI MARKET

BY

MR. APISIT PATTARASAKOLKIAT

AN INDEPENDENT STUDY SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE PROGRAM IN FINANCE (INTERNATIONAL PROGRAM) FACULTY OF COMMERCE AND ACCOUNTANCY THAMMASAT UNIVERSITY

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ABSTRACT

Controversy concerning whether ministry of finance should continue its tax saving policy from investing in long-term equity fund (LTF) in the stock exchange of Thailand have been criticized for several years. The purpose of this study intend to determine (i) existent of dynamic relationship between long-term equity fund (LTF) flows and stock market return, (ii) positive impacts of LTF on stock market return, and (iii) seasonal effects of LTF. The study employs interdependent-dynamic models and time-varying volatility model, including Vector Autoregressive (VARs), Generalized Autoregressive Heteroscedasticity (GARCH) and Bivariate GARCH models. The results confirm the dynamic relationship between LTF flows and stock market return; however, fail to reveal significant evidence of positive impact of LTF flow on stock market return. Additionally, the findings of seasonal effects in December and January support the hypothesis that Thai investors invest in LTF mostly for tax saving purpose.

Keywords: LTF Fund, Tax benefit, Dynamic relationship

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Mr. Apisit Pattarasakolkiat

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Symbols/Abbreviations	Terms
DCA	Dollar Cost Average
FETCO	Federal of Thai Capital Market Organizations
Flowm	LTF mutual funds flow
GARCH	Generalized Autoregressive Conditionally Heteroscedaticity
IRF	Impulse Response Function
LTF	Long-Term Equity Fund
BIGARCH	Bivariate Generalized Autoregressive Conditionally Heteroscedaticity
NAV	Net Asset Value
SET	Stock Exchange of Thailand
SETCLOSE	SET return calculated from closed price
SETOPEN	SET return calculated from open price
TNA	Total Net Asset
VAR	Vector Auto Regression Model

CHAPTER 1
INTRODUCTION

Stock Exchange of Thailand (SET) has become an important capital market since it was established in 1975. There are many investors investing in SET. Many companies have been issuing stocks in SET. In 2014the market capitalization of Stock Exchange of Thailand (SET) has increased from 11.5 trillion Baht to 13.8 trillion baht while trading volume of SET has dropped slightly from 11.7 trillion Baht to 10.2 trillion Baht. SET defines four types of investors, which are local institution investors, local individual or retail investors, foreign investors and proprietary traders. The trading volumes of respective investor are 10% 57% 25% and 8% according to the data provided in SET website.

Although institution investors' trading volume is only 10%, institution investors influence market substantially because of their large buy-sell orders. Kaniel, Saar and Titman (2008) stated that institution and foreign investors are viewed as informed investors while individual (retail) investors are believed to have psychological biases.

Mutual fund managers play important role among institution investors. A mutual fund is an investment vehicle that is made up of a pool of funds collected from many investors for the purpose of investing in securities such as stocks, bonds, money market instruments and similar assets.

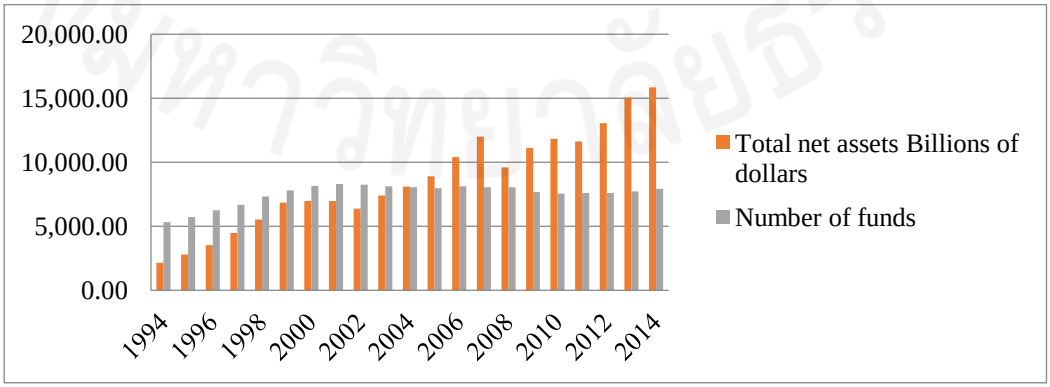


Figure 1.1 Overview of mutual fund industry

Figure 1.1 shows the growth of mutual fund in the past 10 years globally. Total Mutual fund's assets have increased almost eight times from about $2,100 billion in 1994 to $15,842 billion in 2014.

According to www.investorpedia.com, mutual funds have five advantages. Firstly Individual can diversify their investment by investing in mutual fund because many mutual funds have policy to diversify investment. Secondly Investors can diversify investment by mutual fund by a less transaction cost than investing directly because mutual fund can take advantage of their buying and selling size. Thirdly Investors can buy mutual fund with less money than invest directly in financial market. Fourthly Liquidity of mutual funds is high. Fifthly Mutual funds are suitable for investors who do not have enough time and knowledge to invest because mutual funds are managed by professional fund managers.

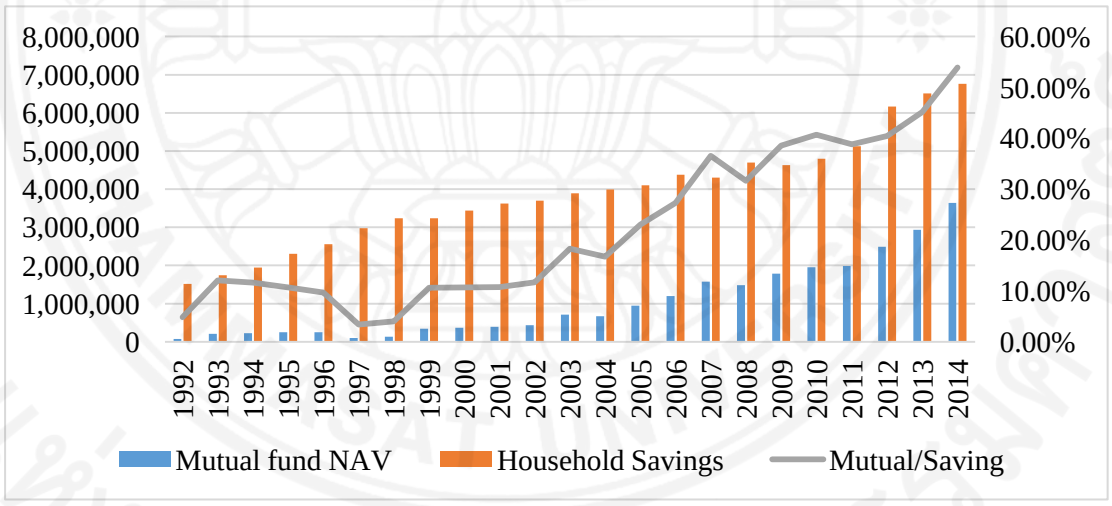


Figure 1.2 Overview of Thai Mutual Fund Industry

In Thailand mutual funds have grown over the past decade. Figure 1.2 shows the huge growth of Thai mutual funds. Total assets of Thai mutual funds have grown by 4.9 times from 73,930 million baht in 1992 to 3,700,000 million baht in 2014. In 1992 total assets of mutual funds were only 4.87% of total saving. This number has increased overtime although it has decreased in 1997 due to economic crisis. In 2014 total assets of mutual funds have increased to approximately 60% of total saving. The

tremendous growth of Thai mutual funds might imply that investors have been more interested in investing in mutual funds than in the past.

Investing in LTF (Long Term Equity) is tax deductible. The policy of LTF (Long Term equity Fund) is to invest at least 65% of total NAV in stocks. There are 2 types of LTF: LTF with and without dividend policy. LTF were set up under IMF program to encourage investors to invest in stock for long-term. Investors can deduct their personal tax payment up to 15% of personal income or 500,000 baht (whichever lower) per year in 5 calendar years or 7 calendar years since 2016. However, if investors withdraw LTF funds before the 5thcalendar year, the tax saving that investors have received previously must be paid back and the capital gain from LTF fund will be taxed 10%.

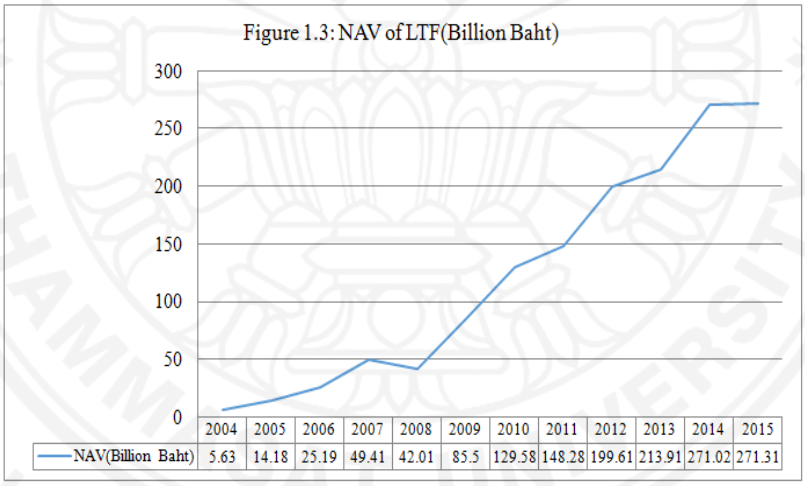


Figure 1.3 NAV of LTF (Billion Baht)

LTF funds have grown in the past 10 years. Figure 2 shows the growth of LTF fund from 5,630 million baht in 2004 to 170,000 million baht in 2014 or about 3,300% in 10 years.

About the investment policy, 49 from 53 LTF funds or 93% of LTF funds are active funds that try to create profit more than benchmark while only 4 from 53 LTF funds are passive funds that try to replicate the benchmark's return.

About tax benefit that investors will receive when investing in LTF funds, there is a long controversial between Federal of Thai Capital Market Organizations (FETCO) and Ministry of Finance. FETCO explain that Tax benefit in LTF funds should be exist forever because tax benefit in LTF funds does not harm the principle of absolute equity in tax system and this measure helps to stabilize Thai market by letting retail investors invest in financial market through institution investors which are not volatile like foreign investors or retail investors. The increasing in NAV of LTF funds is the important supporting evidence. Moreover, LTF funds help people to know about savings via long-term investment.

However, Ministry of Finance argues that LTF cannot stabilize Thai market because investors invest in LTF funds for only tax benefit and do not learn about long-term investment. They point that most of LTF funds investors buy and hold LTF funds for only three years following the condition to receive tax benefit. Moreover, investors buy and sell LTF a lot in December and January respectively and tax benefit in LTF funds harms the principle of absolute equity in tax system because the more revenue people earn, the more tax benefit they receive. (More details at http://thaipublica.org/2014/10/ltf/)

This study tries to finds the effect of LTF funds to Thai market return and the behavioral of LTF fund investors by answering following question.

What is the dynamic relationship between LTF flow and stock market return?

This question tries to find the dynamic relationship between LTF flow and stock market return to investigate the LTF fund managers' behavioral. The dynamic relationship can show that what happen if the SET market return decrease. Is there any LTF inflow when the market is down?

Does an LTF fund flow have any effect on market return?

This question tries to investigate whether the LTF inflow and outflow determine the market return or not.

What are the behavioral of LTF funds investors?

From the Ministry of Finance's statement that investors buy and sell LTF funds a lot in December and January respectively. The behavior of LTF funds investors can prove the correct of this statement.

CHAPTER 2
LITERATURE REVIEW

The market fund flow analysis is the popular topic in financial literature. There are many studies about the relationship between fund flow and stock market return or stock market volatility especially in foreign fund flow and institution. The studies about relationship between foreign fund flow and stock market return are usually found in emerging market. Pavabutr (2004) states that emerging markets are generally small and fairly illiquid. So, extreme price volatility may occur from slight change in trading activity especially foreign equity flows. This study tested the effect of foreign flow on emerging market return by using data from Thai stock exchange. Using cross-sectional analysis and VAR model, this study found that unexpected flow has impact in stock but foreign investors do not cause excess volatility in the market. It only showed extraordinarily high volatility during the crisis period. Kamesaka and Wang (2004) studying the short-term trade performance of individual, institution and foreign investors by using daily buying and selling flow from Thai market. This study also found that there is positive stock return following foreign net buying and negative stock return following individual net buying. Froot O'Connell and Seasholes(1998) investigated the dynamic relationship between daily international portfolio flows into and out of 44 countries from 1994-1998. The method that they used to find the relationship is vector auto regression (VAR) and Granger causality.They found that international inflow was slightly positively correlated across countries but strongly correlated within regions.

Moreover, there are many studies to find the dynamic relationship between mutual fund flows and stock market return. The popular methods that are used to analyze the mutual fund flows and stock market return are vector auto regression (VAR) to find the dynamic relationship and causality test to find whether it is the market return determine mutual fund flows or vice versa.

Alexakis, Niarchos, Patra and Poshakwale (2005) studied about relationship between mutual fund flow and stock return in Greece by using daily closing prices of Athens stock index and net change in the mutual fund units. They used the Granger's

causality test to test the temporal statistical relationship between 2 variables and found that there is a bidirectional causality between mutual fund and stock returns that is the stock return cause the mutual fund flows and vice versa. Oh and Parwada(2007) used vector auto regressive to analyze the relationship between mutual fund flows(purchase, sell and net) and stock market return up to five flow lags to detect and Causality tests are used to test whether it is the market index determine flows or vice versa. The result showed that there is positive relationship between stock market return and mutual fund flows as measured in term of purchases and sales but there is negative relation relationship between stock market return and mutual fund flows as measured in term of net.

Aydogan, Vardar and Tunc (2014) tried to find the dynamic relation of mutual fund flows and Turkish stock returns. VAR and Granger's causality test were applied to this study. The result showed that there exists a relationship between mutual fund flows and stock market return in the long run and there is bidirectional causality between them.

Hossain, Rahman and Rajib(2013) use Toda-Yamamoto(TY) version of Granger causality test to test the dynamic of mutual funds in Dhaka stock exchange(DSE) in four variables: DSE index return, DSE index turnover, mutual fund's return and mutual fund's turnover instead of using traditional Granger causality test because TY version of granger causality test can be used irrespective of order of integration and status of co integration and can also resolve specification bias and spurious problem. Wang (2012) investigate the interactive relationship between stock mutual fund flow and stock market return in Chinese market by regressing monthly times series data by auto-regression model and Granger causality test. The result showed that stock market return has positive relation with concurrent fund flows and this relation is driven by the unexpected component fund flow. There is no evidence of negative correlation between stock return and lag value of flow.

Radowski and Wang (2009) analyzed the dynamics of mutual fund flows and returns in daily data and monthly data by using Vector Auto Regression (VAR) of flows and return. The result show the difference mutual fund investors and investors

who invest directly in securities. The funds investors have contrarian behavioral tendencies in daily data and positively relate with future fund returns and information seems to drive the result. However, with monthly data, the result showed that there was very few statistically significant relationship. Warther(1995) examined monthly data on mutual fund flows and stocks return,bond and gold. He found that mutual funds are highly correlated with securities returns.

Del Guercio and Tkac (2009) compared the relation between asset flow and performance in retail mutual fund and pension fund by using risk-adjusted performance measures. The result can be interpreted that pension managers have little incentive to engage in the risk shifting behavior among mutual fund managers

Cao, Chang and Wang (2008) test the dynamic relation between aggregate mutual fund flow and market volatility by using daily data and VAR approach. The result showed that there is negative relation between market volatility and lagged flow.

About studying in Thai LTF funds, there are a few studies about LTF funds. Pann Ananapibutr (2014) studied about the key factors that drive the growth of investing in LTF funds by using random effects model which have monthly mutual fund growth(panel data) and five independent variables in model: fund's return, tax benefit, expense ratio, management fee and size. The study found that tax benefit is the important factor in growth of LTF fund and also found that investment flow is high in December and decrease in January. Jiraporn Pornpattanakulton (2010) studied to answer whether tax benefit is motivation for investing in LTF and RMF funds by using yearly data and use Sharpe ratio and Two-proportion Z-test as the method. The study found that tax benefit is motivation for investing in RMF and LTF funds.

CHAPTER 3
THEORETICAL FRAMEWORK

3.1 Contrarian Investors and Momentum Investors

Contrarian investors are the investors who believe in profit over popular opinion and have contrarian strategy that invest against the market trend by buying assets that have bad perform and then sell them when they have good perform.

Momentum Investors are the investors who aim to buy or capture the good perform stock and sell them later or try to make profit by following market trend. Momentum investors believe that huge increase in the asset's price will be followed by additional gains.

Many studies showed that contrarian investors who use contrarian strategies can get profit. Kang, Liu and Ni (2002) studied the stock-return behavior in the China Stock market and found statistically significant short-term and intermediate term momentum profits. The more distinct contrarian profits are because of the dominance of stock prices' overreaction to firm specific information. Forner and Marhuenda(2003) studied the Spanish stock-return behavior and found that momentum strategy can create abnormal returns in short-term period but contrarian strategy is effective in the long run. Conrad, Gultekin and Kaul(1997) stated that stock market overreacts to new information and showed that contrarian investors can create profit in the short-run by simply buying losers and selling winners. Chin, Prevost and Gottesman(2002) perform the accounting-based contrarian investment strategies in New Zealand market and found that contrarian strategies make superior cumulative returns during the 1988-1995.

There are many studies imply that institutional investors and foreign investors are contrarian investors while individual investors are momentum such as Radowski and Wang (2009), Cao, Chang and Wang (2008) and Oh and Parwada(2007). The method to specify the type of investors is the dynamic relationship between investors' flow and market return. If the investors are contrarian, the dynamic relationship will be negative.

This study can specify the type of LTF fund manager's strategies by finding the relationship between LTF flow measuring as LTF fund manager's strategies and stock market return. If LTF fund managers are contrarian investors or LTF flow has negative relationship with stock market return, it means that although the market has negative return, there is inflow from LTF fund to support the market.

3.2 Dollar Cost Average(DCA) and Lump sum investment

The money that LTF fund manager use to invest is collected from fund investors. From the view of fund investors who invest in LTF, there are 2 main strategies to invest in asset: Dollar Cost Average and Lump sum investment. Dollar cost average is the technique of buying a fixed amount of investment on regular schedule no matter what the current price. To use DCA, more units are bought when the prices are low and fewer units are bought when the prices are high. Lump sum investment is one-time investment for investing in asset.

DCA is usually suggested by many analysts or investment experts because they believe that DCA enables investors to reduce the short-term impacts of market highs and lows (www.vanguard.com), DCA is the second step in successful savings (www.merrillynch.com) . However, which techniques are appropriate are still discussed in many studies, especially investing in mutual fund. Johnson and Krueger(2004) compared DCA and market timing(lump sum investment) based on S&P500 since 1982-2001 and found that DCA can make profit more than the other in the long run. Merlone and Pilotto(2014) study the efficient of DCA and lump sum investment by considering 30 international funds and 30 stocks to simulate investing over different period windows. The result showed that the risk of portfolio with DCA is lower than portfolio with lump sum investment and DCA is appropriate for risk averse investors.Chin Liu, Chen and Jian Liu compared the performance between DCA and lump sum strategies in mutual fund investment and the result showed that lump sum strategies can surpass DCA only in short-term.

It still has no studies about which strategies that investors use to invest in LTF funds. So, this study will also try to find this point in term of LTF flows. Because of the prospectus of mutual fund that regulate the LTF fund manager must follow the

investment policy especially the proportion of the asset in mutual fund, LTF fund managers will invest immediately when they collect the money from fund investors. So, LTF flows also show the result of this question.

CHAPTER 4
DATA AND METHODOLOGY

4.1 Data

Stock market Return

This study uses daily data of SET index (proxy of overall market) and then calculates daily return from following equation.

$$R_{p,t} = \ln\left(\frac{P_t}{P_{t-1}}\right)$$

Where Ret_t = Return on stock market

P_t = Market Index at time t

P_{t-1} = Market Index at time t-1

About SET index, this study uses both open and close price to receive all the view of the result and reduce the bias if use only close price.

LTF flow

All 52 daily LTF funds can be collected from www.thaimutualfund.com. The LTF data include daily total net asset (TNA) and daily net asset value (NAV) from 2004-2014. Although some LTF funds are passive funds which invest follow the market trend, this study use all 52 LTF funds to reduce the survivorship bias.

LTF fund flows can be calculated by using daily total net asset and daily net asset value following Radowski and Wang (2009), Unphakorn (2014) and Cao, Chang and Wang (2008) as below

$$R_{p,t} = \ln\left(\frac{NAV_{p,t}}{NAV_{p,t-1}}\right)$$

Where $R_{p,t}$ = Return of LTF fund p in period t

$NAV_{p,t}$ = Net asset value of LTF fund p in period t

$NAV_{p,t-1}$ = Net asset value of LTF fund p in period t-1

$$Flow_{p,t} = \frac{TNA_{p,t} - [TNA_{p,t-1} * (1 + R_{p,t})]}{TNA_{p,t-1}}$$

Where $Flow_{p,t}$ = LTF flows of fund p in period t

$TNA_{p,t}$ = Total net asset of LTF fund p in period t

$TNA_{p,t-1}$ = Total net asset of LTF fund p in period t-1

$R_{p,t}$ = Return of fund p in period t

4.2 Methodology

This study separates into 2 parts. The first part is to find the dynamic relationship between LTF flow and SET return to answer 2 questions: 1.What is the dynamic relationship between LTF flow and stock market return? 2. What are the behavioral of LTF funds investors? The second part is to find whether the LTF flow has any effect to SET return to answer the question that is there any effect from LTF flow to SET return?

4.2.2 The dynamic relationship between LTF flow and SET return

The first part of this study is to specify the dynamic relationship between LTF flow and SET return. Cao, Chang and Wang (2008), Oh and Parwada(2007), Radowski and Wang (2009) and Alexakis, Niarchos, Patra and Poshakwale(2005) use Vector Auto Regression(VAR) to find the dynamic relationship between mutual fund flow and market return. The results of these studies showed that market return influenced mutual fund flow and mutual fund flow also influenced market return. These implied that mutual fund flow and market return are related with each other and have dynamic relationship. This study also uses Vector Auto Regression (VAR) because LTF fund flow and SET return tend to be interdependent variables. We can create the VAR model as follow

$$Y_t = A_0 + \sum_{i=1}^{n} A_i Y_{t-1} + \gamma D_t + \varepsilon_t \qquad (4.1)$$

Where

$$Y_t = [\, SETRET_t \quad Flowm_t]'$$

$SETRET_t$ = SET return

$Flowm_t$ = LTF flow

$D_t = [D_{Jant} \quad D_{Dect}]'$

D_{Jant} = dummy variable which are equal 1 when the data is in January

D_{Dect}= dummy variable which are equal 1 when the data is in December

(Both D_{Jant} and D_{Dect} are exogenous variables)

$\varepsilon_t = [\varepsilon_{1t} \qquad \varepsilon_{2t}]'$

WhileA_0, $A_i$and γ are matrix of parameter.

$A_0 = [a_{10} \quad a_{20}]'$

$A_i = \begin{bmatrix} a_{11i} & a_{20i} \\ a_{21i} & a_{22i} \end{bmatrix}$ i= 1, 2, 3,…..,m

$\gamma = \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix}$

Variance of error term is

Var(ε_{1t} ε_{2t}) = $\begin{bmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{21} & \sigma_2^2 \end{bmatrix}$

The reason to put 2 exogenous dummy variables are followed below

1. To reduce the seasonal effect because LTF funds have some specific points which differ from general mutual funds? As we explain previously, Investors who hold LTF funds for 5 calendar years or 7 calendar years since 2016 to receive tax benefit. The calendar year means that investor can buy LTF fund at whenever date in that year and sell at whenever date in next 5 years. So, almost investors buy LTF

funds in December and sell them in January next 5 years. So, it has much buy volume in December and sell volume in January(seasonal effect)

2. To investigate the behavior of LTF funds investors that whether investors buy and sell LTF funds a lot in December and January respectively .So, these 2 exogenous dummy variables will answer this question. We can investigate the behavioral of LTF funds investors via LTF flow because LTF fund manager must maintain the proportion of asset in LTF. So, when investors pay cash to buy LTF funds, LTF fund manager must liquidate cash that is received from investors to allocate LTF's portfolio.

About optimal lag, this study defines optimal lag by using Schwartz Criteria and determines number of optimal lag from the lowest value of SBIC.

Moreover, this study uses daily LTF flow and daily SET return. Daily financial data are high-frequency data and tend to have time varying volatility. Generalized Autoregressive Conditionally Heteroscedaticity (GARCH) is suit for these data. We can generate GARCH (1,1) model as follow

Mean equation:

$$SETRET_t = a_{10} + \sum_{i=1}^{m} a_{11i} SETRET_{t-1} + \sum_{i=1}^{m} a_{12i} Flowm_{t-1} + \gamma_{11} D_{Jant} + \gamma_{12} D_{Dect} + \varepsilon_{1t} \quad (4.2)$$

$$Flowm_t = a_{20} + \sum_{i=1}^{m} a_{21i} SETRET_{t-1} + \sum_{i=1}^{m} a_{22i} Flowm_{t-1} + \gamma_{21} D_{Jant} + \gamma_{22} D_{Dect} + \varepsilon_{2t} \quad (4.3)$$

Variance equation:

$$\sigma_{1t}^2 = \alpha_{10} + \alpha_{11}\sigma_{1t-1}^2 + \alpha_{12}\mu_{1t-1}^2 + \delta_{11} D_{Jant} + \delta_{12} D_{Dect} \quad (4.4)$$

$$\sigma_{2t}^2 = \alpha_{20} + \alpha_{21}\sigma_{2t-1}^2 + \alpha_{22}\mu_{2t-1}^2 + \delta_{21} D_{Jant} + \delta_{22} D_{Dect} \quad (4.5)$$

Where σ_{1t}^2= Conditional variance of ε_{1t}

σ_{2t}^2= Conditional variance of ε_{2t}

GARCH model is suitable for high-frequency data. However, LTF flow and SET return in this study are not only high-frequency data but they are also interdependent variables as we explain previously. GARCH has static mean equation which is not appropriated for interdependent variables and VAR model cannot fix heteroscedaticity problem.

The model for interdependent and high-frequency data is Bivariate Generalized Autoregressive Conditionally Heteroscedaticity (BIGARCH). We can generate BIGARCH model for this study as follow

Mean equation:

$$Y_t = A_0 + \sum_{i=1}^{n} A_i Y_{t-1} + \gamma D_t + \varepsilon_t \qquad (4.6)$$

Where

$$Y_t = [\, SETRET_t \quad Flowm_t]'$$

$$D_t = \begin{bmatrix} D_{Jant} & D_{Dect} \end{bmatrix}'$$

$$\varepsilon_t = [\varepsilon_{1t} \qquad \varepsilon_{2t}\,]'$$

WhileA_0, $A_i$and γ are matrix of parameter.

$$A_0 = [a_{10} \quad a_{20}]'$$

$$A_i = \begin{bmatrix} a_{11i} & a_{20i} \\ a_{21i} & a_{22i} \end{bmatrix} \quad \text{i= 1,2,3,…..,m}$$

$$\gamma = \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix}$$

Variance equation

$$\sigma_{1t}^2 = \alpha_{10} + \alpha_{11}\sigma_{1t-1}^2 + \alpha_{12}\mu_{1t-1}^2 + \delta_{11}D_{Jant} + \delta_{12}D_{Dect} \qquad (4.7)$$

$$\sigma_{2t}^2 = \alpha_{20} + \alpha_{21}\sigma_{2t-1}^2 + \alpha_{22}\mu_{2t-1}^2 + \delta_{21}D_{Jant} + \delta_{22}D_{Dect} \qquad (4.8)$$

Variance of error term is

$$\text{Var}(\varepsilon_{1t} \ \ \varepsilon_{2t}) = \begin{bmatrix} \sigma_{1t}^2 & \sigma_{12t} \\ \sigma_{21t} & \sigma_{2t}^2 \end{bmatrix}$$

$$\sigma_{12t} = \sigma_{21t} = \rho$$

3.2.2 The effect of LTF flow to SET return

The second part is to find whether LTF flow has effect to SET return or not. This study also method following Cao, Chang and Wang (2008), Oh and Parwada(2007), Radowski and Wang (2009) and Alexakis, Niarchos, Patra and Poshakwale(2005), **Granger Causality test**. We can use causality test to VAR model with 2 null hypothesis: Set return does not granger-cause LTF flow and LTF flow does not granger-cause SET return.

Moreover, **Impulse Response Function** and **Variance Decomposition** are also applied to test whether LTF flow has effect to SET return. . Impulse Response Function refers to the reaction of any dynamic system in response to some changes. Impulse Response Function for this study has equation as follow

$$Y_t = A_0 + \sum_{i=0}^{\infty} \emptyset_i \, \varepsilon_{t-i}$$

Where

$$A_0 = [a_{10} \quad a_{20}]'$$

$$\emptyset_i = \begin{bmatrix} \emptyset_{11i} & \emptyset_{12i} \\ \emptyset_{21i} & \emptyset_{22i} \end{bmatrix}$$

$$\varepsilon_t = [\varepsilon_{1t-i} \qquad \varepsilon_{2t-i}]'$$

$\emptyset_{11i}$, $\emptyset_{12i}$, $\emptyset_{21i}$ and $\emptyset_{22i}$are Impulse Response Function

Impulse Response Function is used to measure the shock in one variable to other variable and itself.

Variance decomposition or forecast error variance decomposition is used to help interpreting VAR model. Variance decomposition indicates the amount of information each variable contributes to the other variables in the auto regression.

CHAPTER 5
EMPIRICAL RESULT

This study applies both closed price and open price to calculate SET return. So, empirical result is divided into 2 parts: “the empirical result between LTF flows and SET return (calculated by close price)” and “the empirical result between LTF flows and SET return (calculated by open price)”. In addition, each part contains the result in VAR model, Granger Causality Test, Impulse Response Function, Forecast Error Variance Decomposition, GARCH model and BIGARCH model.

5.1 The empirical result (calculated by close price)

We use VAR model, GARCH (1, 1) and BIGARCH to find the dynamic relationship. SET return (calculated by closed price) and LTF flow are stationary (the result of Augmented Dickey-Fuller test and Phillips-Perron Test are showed in appendix) and use Granger Causality Test, Impulse Response Function and Forecast Error Variance Decomposition to test the effect of LTF flow

Table 5.1 Important result from VAR, GARCH and MGARCH Model (Closed Price)

	VAR		GARCH1 SETCLOSE		GARCH2 Flowm		BIGARCH	
1. Flowm								
Flowm L1.	0.5103	** *			0.8662	** *	0.8662	** *
SETCLOSE L1.	-1620.3192	** *			526.8617	** *	-1257.8814	** *
Jan	-147.4416	** *			-5.7566	** *	-119.2481	** *
Dec	332.1794	** *			190.5618	** *	122.3064	** *
_cons	10.8801	**			5.3502	** *	3.2497	**
2. SETCLOSE								
Flowm L1.	-0.000001		-0.000001				-0.000001	
SETRET L1.	0.0096		0.0613				0.0612	** *
Jan	-0.0006		-0.0007				-0.0007	
Dec	0.0018		0.0020	**			0.0015	*
_cons	0.0007	**	0.0008	** *			0.0009	** *
3. ARCH_Flowm								
arch L1.					1.7510	** *	0.1479	** *
Jan					-1.8691	** *	5.0185	** *
Dec					2.6853	** *	3.1382	** *
_cons					6.0062	** *	7.9021	** *
4. ARCH_SETCLOSE								
arch L1.			0.5158	** *			0.3847	** *
Jan			0.2275	**			0.1646	
Dec			-0.1224	** *			-0.5585	** *
_cons			-9.2835	** *			-9.3260	** *
5. Correlation								
Flowm& SETCLOSE							-0.0027	
6. Statistics								
N	1912		1912		1912		1912	
ll	-6946.0856		-7406.2728		-14946.329		-5412.8925	
chi2			8.9492	** *	1425.5337	** *	2574.0974	** *

Legend:*p<.1;**p<.05;***p<.01

Note:

1. SETCLOSE is SET return variable calculated from closed price, Flowm is LTF flow variable, Jan and Dec are dummy variables are equal to 1 when the data is in January and December respectively and correlation is ρ.

2. The result from VAR column is from VAR model (4.1).

3. The result from GARCH SETCLOSE column is from GARCH model with mean equation (4.2) and variance equation (4.4)

4. The result from GARCH Flowm column is from GARCH model with mean equation (4.3) and variance equation (4.5)

5. The result from BiGARCH column is from BiGARCH model with mean equation (4.2) and variance equation (4.6) and variance equation (4.7) and (4.8)

6. ARCH_Flowm and Arch_SETCLOSE show the result from variance equation in GARCHand BiGARCH model

From VAR column, this study uses lag 1 as optimal lag following Schwartz criteria (lowest SBIC) and VAR model satisfies the stability condition. The result from VAR column states that when LTF flow is dependent variable and SET return calculated from closed price or SETCLOSE is independent variable (in row 1 column and column VAR) there is significant negative relationship between SET return and LTF flow. In addition, the results in both dummy variables, Jan and Dec, also reject the null hypothesis that there is no difference LTF flow between January and the rest of month and between December and the rest of month. It means that LTF flow decreases significantly in January (parameter of dummy in January is -147.446) and LTF flow increases significantly in December (parameter of dummy in January is 332.1794)

From row 2 and column VAR, the results show that when SET return is dependent variable and LTF flow is independent variable there is insignificant relationship. Moreover, the results from both dummy variable, Jan and Dec, fail to reject the null hypothesis that there is no difference SET return between January and the rest of month and between December and the rest of month. It implies that SET return does not decrease or increase significantly in January and December.

Table 5.2 Granger Causality test (Closed Price)

	Equation	Excluded	chi2	df	p-Value
1	Flowm	SETCLOSE	24.917	1	0
	Flowm	ALL	24.917	1	0
2					
	SETCLOSE	Flowm	1.4126	1	0.235
	SETCLOSE	ALL	1.4126	1	0.235

Note:

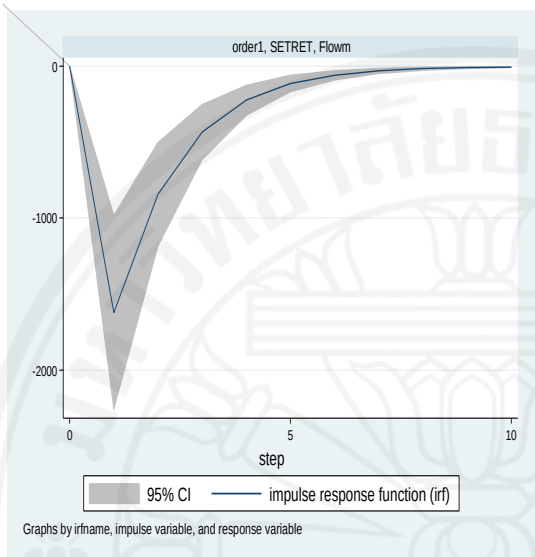
Row 1 shows the result under null hypothesis: Set return does not granger-cause LTF flow.

Row 2 shows the result under null hypothesis: LTF flow does not granger-cause Set return.

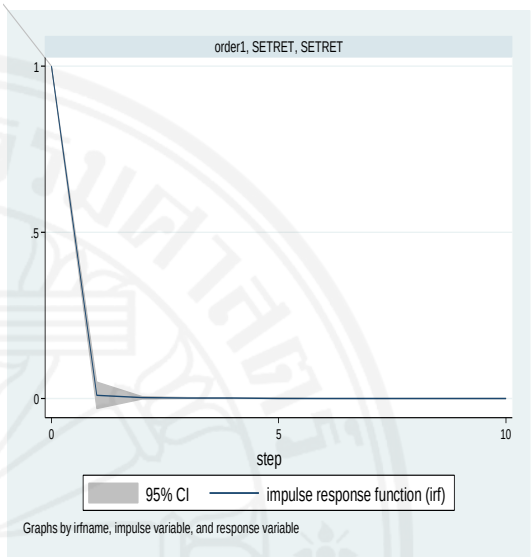
Table 5.2 shows the result of Granger Causality test. The result in row 1 rejects the null hypothesis: Set return does not granger-cause LTF flow because p-value in row 1 is less than 0.05 confidence level. It implies that SET return cause the LTF flow. However, p-value in row 2 is more than 0.05 and fails to reject null

hypothesis: LTF flow does not granger-cause SET return. It implies that LTF flow does not cause SET return

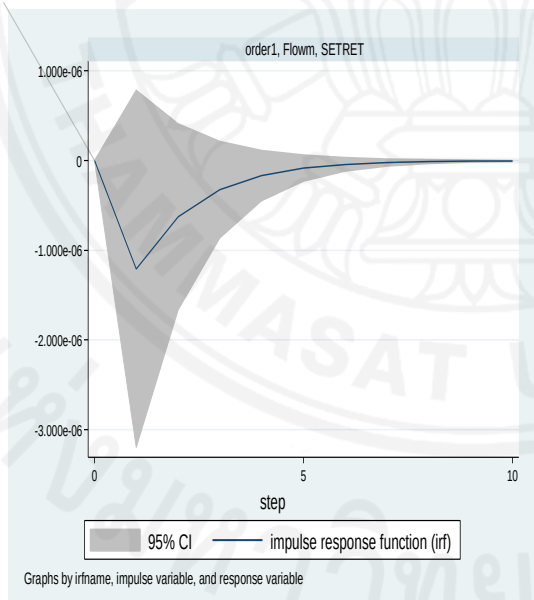
Figure 5.1 Impulse Response Function Graph (Closed Price)



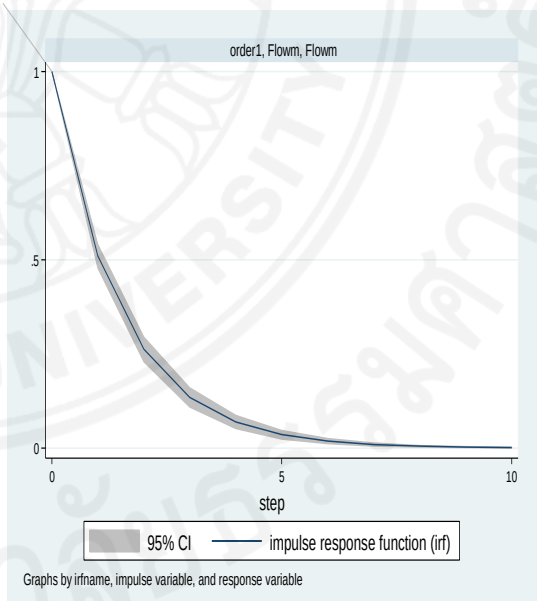
Note: Impulse- SET return, Response - LTF flow



Note: Impulse - SET Return, Response – SET return



Note: Impulse- LTF flow, Response – SET return



Note: Impulse- LTF flow, Response - LTF flow

Figure 5.1 shows that the impact of shock in SET return to LTF flow is large and negative in first part and closes to 0 in the long run. While the impacts of shock in LTF flow to SET return is extremely low and goes to 0 in the long run

Table 5.3 Impulse Response Function (Closed Price)

	Impulse of SETCLOSE response to LTF Flows	Impulse of SETCLOSE response to SETCLOSE	Impulse of LTF Flows response to SETCLOSE	Impulse of LTF Flows response to LTF Flows
0	0	1	0	1
1	-1620.32	0.009569	-0.0000012	0.510253
2	-842.276	0.002046	-0.00000063	0.262312
3	-433.088	0.001035	-0.00000032	0.134861
4	-222.662	0.000532	-0.00000017	0.069336
5	-114.476	0.000274	-0.000000085	0.035647
6	-58.8553	0.000141	-0.000000044	0.018327
7	-30.259	0.000072	-0.000000023	0.009422
8	-15.5569	0.000037	-0.000000012	0.004844
9	-7.99822	0.000019	-0.000000006	0.002491
10	-4.11209	0.0000098	-0.0000000031	0.00128

From the table 5.3, at all of time period except period 0, SET return has negative impact to LTF flow and LTF flow also has negative impact to SET return. Impulse/Shock on SET return at period 1 causes response or impact on LTF flow -1620.32 and Impulse/Shock on LTF flow causes response or impact on SET return closely zero. All impulse response go to 0 in the long period.

Table 5.4 Forecast Error Variance Decomposition (Closed Price)

	Impulse of SETCLOSE response to LTF Flows	Impulse of SETCLOSE response to SETCLOSE	Impulse of LTF Flows response to SETCLOSE	Impulse of LTF Flows response to LTF Flows
0	0	0	0	0
1	0	0.999852	0.000148	1
2	0.008155	0.99948	0.00052	0.991845
3	0.009804	0.99938	0.00062	0.990196
4	0.010211	0.999354	0.000646	0.989789
5	0.010317	0.999347	0.000653	0.989683
6	0.010345	0.999345	0.000655	0.989655
7	0.010352	0.999345	0.000655	0.989648
8	0.010354	0.999344	0.000656	0.989646
9	0.010355	0.999344	0.000656	0.989645
10	0.010355	0.999344	0.000656	0.989645

From the table 5.4, variance of both 2 variables are caused by orthogonal from them self about 1. For all period except period 0 and 1, value from variance of LTF flow caused by orthogonal innovation from SET return are much higher than the variance of SET return by orthogonal innovation from LTF flow.

Back to table 5.1, the results from both GARCH models are similar to VAR model. In row 2 and column GARCH SETCLOSE, the results show that when SET return (SETCLOSE) is dependent variable and LTF flow (Flowm) is independent variable there is not only insignificant relationship but the results from both dummy variables, Jan and Dec, also show insignificant difference although the results from variance result (row 4 and column GARCH SETCLOSE) show significant variance in only Dec dummy variable but show insignificant variance in Jan dummy variable with 95% confident level.

In table 5.1 row 1 and column GARCHFlowm, the results are similar to the results in row 1 and column VAR. They show that when LTF flow is dependent variable and SET return is independent variable there is significant relationship and the results from variance equation in row 3 show significant variance in Jan and Dec.

About the results from BIGARCH model (in column BIGARCH), they are similar to the result from VAR model. There is significant negative relationship and there are significant difference in both dummy variable when LTF flow is dependent variable and SET return is independent variable (row 1 and column BIGARCH) and SET return cause high variance in LTF flow (row 3). When SET return is dependent variable and LTF flow is independent variable (row2), there is insignificant relationship and insignificant difference in both dummy variables.

About the correlation between both variables, the result in row 5 states that there is insignificant correlation between both variables.

The results from all tests can be interpreted that SET return and LTF flow have negative relationship between each other and SET return has effect to LTF flow. When SET return goes down, there is LTF inflow to market (following the result from VAR, GARCH and BIGARCH models). However, LTF flow that occurs when SET return goes down has no effect to SET return and the effect of shock in LTF flow to SET return is very low.

About the behavior of LTF funds investors, the empirical result implies that sell volume in January is more than other months and buy volume in December is more than other months. Moreover, SET return causes LTF flow's variance in January and December higher than other months.

5.2 The empirical result between LTF flows and SET return (calculated from open price)

The method used to find the dynamic relationship is similar to part 4.1.1, VAR model, GARCH (1, 1) and BIGARCH. SET return (calculated by open price) and LTF flow are stationary (the result of Augmented Dickey-Fuller test and Phillips-Perron Test are showed in appendix) and use Granger Causality Test, Impulse Response Function and Forecast Error Variance Decomposition to test the effect of LTF flow

Table 5.5 Important result from VAR, GARCH and MGARCH Model (Open Price)

Variable	VAR		GARCH1 SETOPEN		GARCH2 Flowm		MGARCH	
1. Flowm								
Flowm L1.	0.5050	***			0.8583	***	0.8583	***
SETOPEN L1.	-2146.7984	***			105.8202	***	-1221.2417	***
jan	-147.4529	***			-4.5439	***	-117.2030	***
dec	336.0141	***			332.6748	***	126.0246	***
_cons	11.9957	***			6.0916	***	3.3935	***
2. SETOPEN								
Flowm L1.	0.0001		0.0001				0.0000	
SETOPEN L1.	-0.0492	***	0.0377				0.0377	
jan	-0.0007		-0.0013				-0.0013	
dec	0.0028	***	0.0033	***			0.0023	*
_cons	0.0001		0.0008	***			0.0004	
3. ARCH_flowm								
arch L1.					1.6565	***	0.1527	***
jan					-1.6676	***	5.0440	***
dec					4.5758	***	3.1628	***
_cons					5.9545	***	7.8849	***
4.ARCH_SETOPEN								
arch L1.			0.3046	***			0.4636	***
jan			0.2188	*			0.2852	*
dec			0.4103	***			0.0881	
_cons			-9.0130	***			-9.1336	***
5. Correlation flowm SETOPEN								
_cons							-0.1469	***
6. Statistics								
N	1912		1912		1912		1912	
ll	-7235.4154		-5581.5553		-11582.506		-5672.8241	
chi2			14.38075	***	238.0665	***	2447.7295	***

Legend:*p<.1;**p<.05;***p<.01

Note: 1. SETCLOSE is SET return variable calculated from closed price, Flowm is LTF flow variable, Jan and Dec are dummy variables are equal to 1 when the data is in January and December respectively and correlation is ρ.

2. The result from VAR column is from VAR model (4.1).

3. The result from GARCH SETCLOSE column is from GARCH model with mean equation (4.2) and variance equation (4.4)

4. The result from GARCH Flowm column is from GARCH model with mean equation (4.3) and variance equation (4.5)

5. The result from BiGARCH column is from BiGARCH model with mean equation (4.2) and variance equation (4.6) and variance equation (4.7) and (4.8)

6. ARCH_Flowm and Arch_SETCLOSE show the result from variance equation in GARCHand BiGARCH model

The results from table 5.5 are quite similar to the results in table 4.1. From VAR column, this study also uses lag 1 as optimal lag following Schwartz criteria (lowest SBIC) and VAR model satisfies the stability condition. The result from VAR column states that when LTF flow is dependent variable and SET return calculated from open price or SETOPEN is independent variable (in row 1 column and column VAR) there is significant negative relationship between SET return and LTF flow. In addition, the results in both dummy variables, Jan and Dec, also reject the null hypothesis that there is no difference LTF flow between January and the rest of month and between December and the rest of month. It means that LTF flow decreases significantly in January (parameter of dummy in January is -147.4529) and LTF flow increases significantly in December (parameter of dummy in January is 336.0141).

From row 2 and column VAR, the results show that when SET return is dependent variable and LTF flow is independent variable there is insignificant relationship. Moreover, the results from both dummy variable, Jan and Dec, fail to reject the null hypothesis that there is no difference SET return between January and the rest of month and between December and the rest of month. It implies that SET return does not decrease or increase significantly in January and December.

To test whether LTF flow has effect to SET return, we use Granger Causality Test to VAR model, Impulse Response Function and Variance Decomposition.

Table 5.6 Granger Causality test (Open Price)

	Equation	Excluded	chi2	df	Prob>chi2
1	**Flowm**	SETOPEN	47.442	1	0
	Flowm	ALL	47.442	1	0
2					
	SETOPEN	Flowm	1.811	1	0.178
	SETOPEN	ALL	1.811	1	0.178

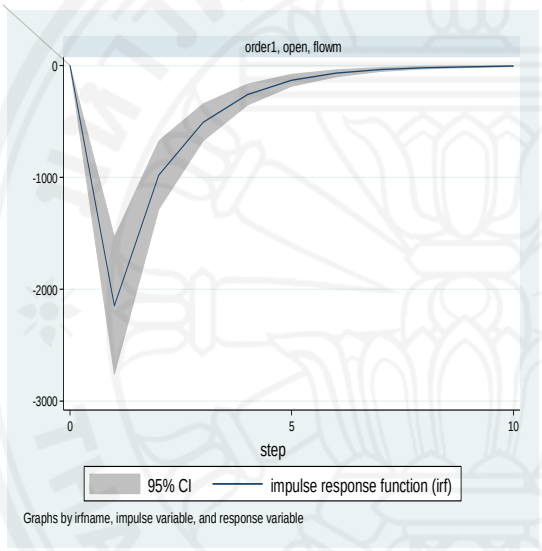
Note:

Row 1 shows the result under null hypothesis: Set return does not granger-cause LTF flow.

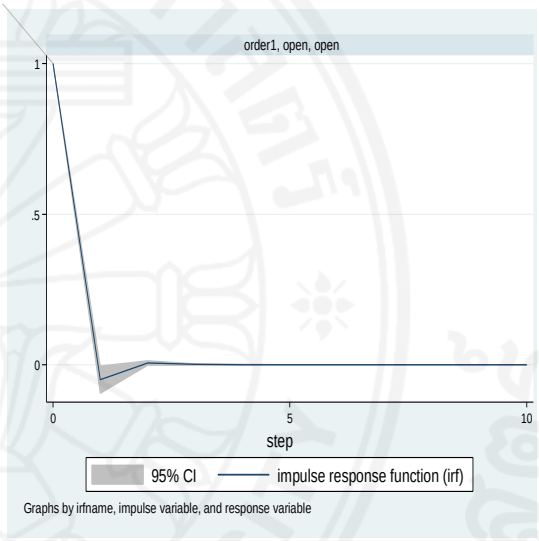
Row 2 shows the result under null hypothesis: LTF flow does not granger-cause Set return

Table 5.6 shows the result of Granger Causality test. The result in row 1 rejects the null hypothesis: Set return does not granger-cause LTF flow because p-value in row 1 is less than 0.05 confidence level. It implies that SET return cause the LTF flow. However, p-value in row 2 is more than 0.05 and fails to reject null hypothesis: LTF flow does not granger-cause SET return. It implies that LTF flow does not cause SET return.

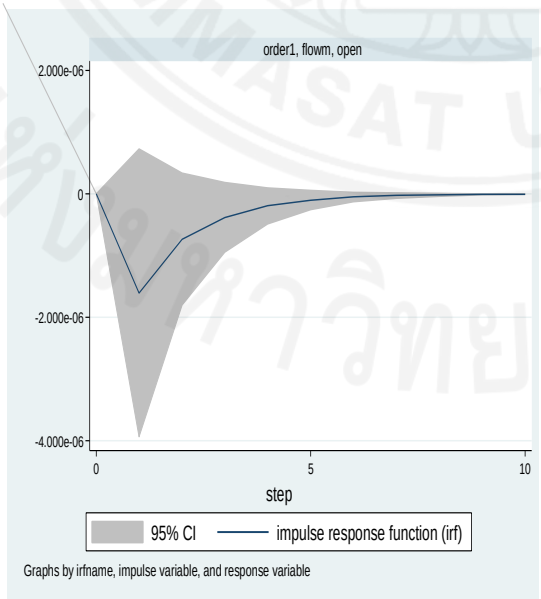
Figure 5.2 Impulse Response Function Graph (Open Price)



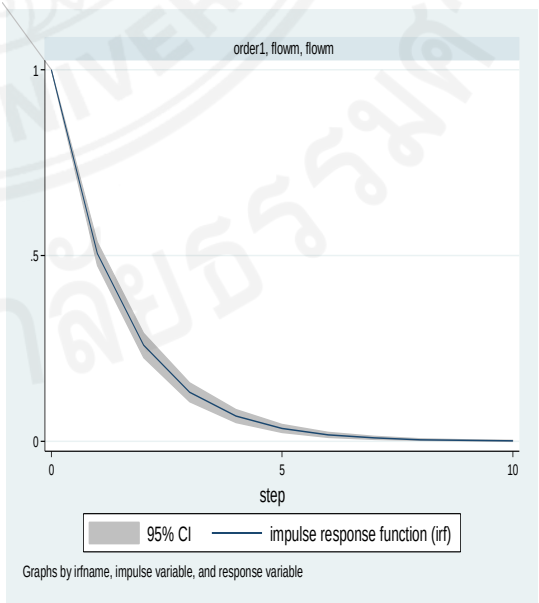
Note: Impulse- SET return, Response - LTF flow



Note: Impulse- SET return, Response - SET return



Note: Impulse- LTF flow, Response - SET return



Note: Impulse- LTF flow, Response - LTF flow

Figure 5.2 shows that the impact of shock in SET return to LTF flow is large and negative in first part and closes to 0 in the long run. While the impacts of shock in LTF flow to SET return is extremely low and goes to 0 in the long run.

Table 5.7 Impulse Response Function (Open Price)

	Impulse of SET return response to LTF Flows	Impulse of SET return response to SET return	Impulse of LTF Flows response to SET return	Impulse of LTF Flows response to LTF Flows
0	0	1	0	1
1	-2146.8	-0.04922	-0.0000016	0.505045
2	-978.57	0.005864	-0.00000073	0.258512
3	-506.811	0.00128	-0.00000038	0.132129
4	-258.711	0.00075	-0.00000019	0.067544
5	-132.27	0.000378	-0.000000099	0.034527
6	-67.6136	0.000193	-0.00000005	0.01765
7	-34.5632	0.000099	-0.000000026	0.009022
8	-17.6683	0.000051	-0.000000013	0.004612
9	-9.03179	0.000026	0.0000000067	0.002358
10	-4.61694	0.000013	-0.0000000034	0.001205

From the table 5.7, at all of time period except period 0, SET return has negative impact to LTF flow and LTF flow also has negative impact to SET return. Impulse/Shock on SET return at period 1 causes response or impact on LTF flow -2146.8. and Impulse/Shock on LTF flow causes response or impact on SET return closely zero.

Table 5.8 Forecast Error Variance Decomposition (Open Price)

	Impulse of SET return response to LTF Flows	Impulse of SET return response to SET return	Impulse of LTF Flows response to SET return	Impulse of LTF Flows response to LTF Flows
0	0	0	0	0
1	0	0.996898	0.003102	1
2	0.019563	0.99655	0.00345	0.980437
3	0.022342	0.996447	0.003553	0.977658
4	0.023045	0.99642	0.00358	0.976955
5	0.023224	0.996413	0.003587	0.976776
6	0.023271	0.996412	0.003588	0.976729
7	0.023283	0.996411	0.003589	0.976717
8	0.023287	0.996411	0.003589	0.976713
9	0.023287	0.996411	0.003589	0.976713
10	0.023288	0.996411	0.003589	0.976712

From the table 5.8, variance of both 2 variables are caused by orthogonal from them self about 1. For all period except period 0 and 1, value from variance of LTF flow caused by orthogonal innovation from SET return are much higher than the variance of SET return by orthogonal innovation from LTF flow.

Back to table 5.5, the results from both GARCH models are similar to VAR model. In row 2 and column GARCH SETOPEN, the results show that when SET return (SETOPEN) is dependent variable and LTF flow (Flowm) is independent variable there is not only insignificant relationship but the results from both dummy variables, Jan and Dec, also show insignificant difference. The results from variance result (row 4 and column GARCH SETOPEN) show significant variance in only Dec dummy variable but show insignificant variance in Jan dummy variable with 95% confident level.

In table 5.5 row 1 and column GARCHFlowm, the results are similar to the results in row 1 and column VAR. They show that when LTF flow is dependent variable and SET return is independent variable there is significant relationship and the results from variance equation in row 3 show significant variance in Jan and Dec.

About the results from BIGARCH model (in column BIGARCH), they are similar to the result from VAR model. There is significant negative relationship and there are significant difference in both dummy variable when LTF flow is dependent variable and SET return is independent variable (row 1 and column BIGARCH) and SET return cause high variance in LTF flow (row 3). When SET return is dependent variable and LTF flow is independent variable (row2), there is insignificant relationship and insignificant difference in both dummy variables.

About the correlation between both variables, the result in row 5 states that there is significant correlation between both variables (it's different from previous part).

The results in both 2 parts can be interpreted that SET return and LTF flow have negative relationship between each other and SET return has effect to LTF flow. When SET return goes down, there is LTF inflow to market (following the result from VAR, GARCH and BIGARCH models). However, LTF flow that occurs when SET return goes down has no effect to SET return and the effect of shock in LTF flow to SET return is very low.

About the behavioral of LTF funds investors, the empirical result implies that sell volume in January is more than other months and buy volume in December is more than other months. Moreover, SET return causes LTF flow's variance in January and December higher than other months.

From all 2 parts of empirical result, we can summarize that SET return and LTF flow have negative relationship between each other and SET return has effect to LTF flow but LTF flow has no effect to SET return. In addition, investors tend to buy LTF funds a lot in December and sell LTF funds a lot in January.

CHAPTER6
CONCLUSION, DISCUSSION AND RECOMMENDATION

6.1 Conclusion

This study tries to answer the three main questions as follow

What is the dynamic relationship between LTF flow and stock market return?

To answer this question, this study uses vector auto regression (VAR) that is suitable for two data that are related with each other. The result show that LTF flow and SET return have negative relationship (both SET return that calculate from close price and open price) which mean that when the market decreases there is LTF inflow. Moreover, the result implies that LTF fund manager tend to be contrarian investors.

From BIGARCH model, LTF flow, there is significant correlation between LTF flow and SET return that is calculated from open price but there is no significant correlation between LTF flow and SET return that is calculated from closed price.

Does an LTF fund flow have any effects on market return?

Although there is LTF inflow when SET return decrease, Granger causality test indicates that LTF flow does not cause the SET return while SET return (both from open price and close price) cause the LTF flow.

Moreover, the result from impulse response function and forecast error variance decomposition also suggest that the impact from LTF flow to SET return has much less than the impact from SET return to LTF flow.

What is the behavioral of LTF funds investors?

The behavioral of LTF funds investors can be seen from 2 dummy variables (Jan and Dec) in VAR model and BIGARCH model. The result show that both dummy variables: Jan and Dec are significant negative and positive relationship respectively. The results from GARCH and BIGARCH also show that SET return cause higher variance in LTF flow but LTF flow does not cause higher variance in SET return

6.2 Discussion

There are many studies about dynamic relationship between mutual fund flow and market return, especially from foreign, which are mentioned in literature review such as Alexakis, Niarchos, Patra and Poshakwale (2005) studied relationship between mutual fund flows and stock return in Greece, Oh and Parwada(2007) analyzed the relationship between mutual fund flows and stock market returns in Korea, Aydogan, Vardar and Tunc (2014) revealed the dynamic relationship of mutual fund flows and Turkish stock returns etc. Most studies use VAR and Granger causality to test the relationship between mutual fund flow and market return and also find that there is relationship between mutual fund flow and market return and there is bidirectional relationship.

However, this study shows that there is significant relationship between LTF flow and SET return only when SET return is independent variable and SET return only causes the LTF flow or there is no bidirectional as foreign studies.

Moreover, this study investigates not only in dynamic relationship but also focuses in variance of LTF flow and SET return in specific time by using Bivariate Generalized Autoregressive conditionally Heteroscedaticity (BIGARCH) and found that there is high LTF flow's variance caused by SET return but there is no high variance's SET return caused by LTF flow.

Comparing with other studies about Thai LTF funds, there are two studies about LTF funds, including Pornpattanakulton (2010) and Ananapibutr (2014). The results of this study are in line with the two studies about the motivation for investing in LTF funds. It confirms that tax benefit is the motivation for investing in LTF funds because this study also finds that there is high inflow in December that similar the result in earlier 2 studies. Moreover, this study finds that there are also high LTF flow's variance in December and January.

From the controversy between Federal of Thai Capital Market Organizations (FETCO) and Ministry of Finance about tax benefit in LTF funds, FETCO claims that tax benefit in LTF funds can stabilize the market by supporting retail investors to

invest through institute investors. Empirical results show that LTF inflow occurs when SET return decrease but it has no effect to SET return. So, there is no evidence to support that LTF funds can stabilize the market as FETCO's claim.

In addition, the empirical results show that there is significant relationship and more volatility in both dummy variables (January and December).Result in dummy variables implies that fund investors tend to buy and sell more LTF funds in December and January than any other months. So, this result follows Ministry of Finance's claim.

6.3 Recommendation

6.3.1 Retail Investors

From this study, the result shows no evidence to support that investing in LTF funds is the long-term investment. The reason is that almost investors invest LTF funds for only three years and use lump sum strategy. Retail investors should invest for more than five years and use dollar cost average strategy because it is suitable for long-term investment according to theoretical framework in this study and invest more in other funds which are suit for individual's risk tolerance.

6.3.2 Federal of Thai Capital Market Organizations (FETCO) and Ministry of Finance

Ministry of finance states that tax benefit in LTF funds causes government's revenue decrease. Moreover, there is no evidence to support FETCO's claims that LTF funds can stabilize the market. So, FETCO and Ministry of Finance should find other policies to encourage people invest or save in the long term and does not harm government's revenue too much

6.3.3 Further Studies

This study has some limitations. First, it only answers whether the LTF flow effect the SET return, dynamic relationship and volatility of LTF flow that can answer whether LTF stabilize the market and the behavioral of LTF fund investors which is only some part of the controversy. This study cannot tell that whether tax benefit in

LTF funds harms the principle of tax and whether people know about long-saving or long term investment via LTF funds

This study can be developed by expanding the research to investigate about effect of tax benefit to principle of tax or whether people invest more in mutual funds after buying LTF funds at first which means that LTF funds can help people to know more about in saving and long-term investment.

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APPENDIX

APPEXDIX A

STATIONARY TEST AND STABILITY TEST

Table A.1 Stationary test-Augmented Dickey-Fuller Test (Closed Price)

Variables	Constant with trend		Constant no trend		No constant no trend	
	t stat	P-value	t stat	P-value	t stat	P-value
SETCLOSE	-48.43	0.00	-48.453	0.00	-48.351	0.00
Flowm	-21.412	0.00	-21.388	0.00	-21.24	0.00

Table A.2 Stationary test-Phillips-Perron Test (Closed Price)

Variables	Constant with trend		Constant no trend		No constant no trend	
	t stat	P-value	t stat	P-value	t stat	P-value
SETCLOSE	-48.471	0.00	-48.494	0.00	-48.336	0.00
Flowm	-23.731	0.00	-23.662	0.00	-23.318	0.00

Table A.3 Schwartz Criteria (Closed Price)

lag	LL	LR		df	p	FPE		AIC		HQIC		SBIC	
0	-1527.55					8.0773		7.7648		7.7888		7.8253	
1	-1140.76	773.57	*	4	0	1.1629	*	5.8267	*	5.8666	*	5.9274	*
2	-1136.77	7.9908		4	0.092	1.1629		5.8267		5.8826		5.9677	
3	-1134.52	4.4943		4	0.343	1.1733		5.8356		5.9074		6.0169	
4	-1130.93	7.1891		4	0.126	1.1757		5.8376		5.9254		6.0592	

Table A.4 Eigenvalue stability condition (Closed Price)

Eigenvalue	Modulus
0.5141	0.5141
0.0057	0.0057

Figure A.1 Eigenvalue stability condition (Closed Price)

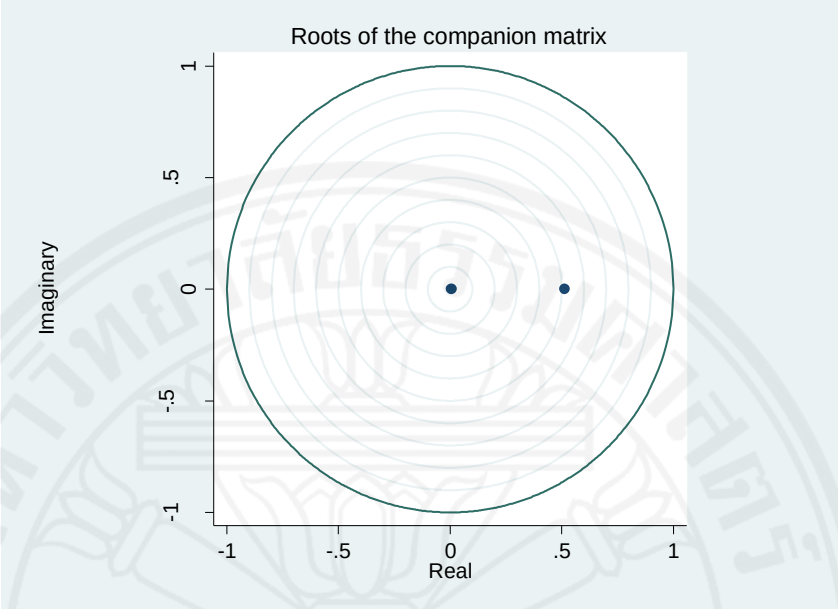


Table A.5 Stationary test-Augmented Dickey-Fuller Test (OpenPrice)

Variables	Constant with trend		Constant no trend		No constant no trend	
	t stat	P-value	t stat	P-value	t stat	P-value
SETOPEN	-26.29	0.00	-26.276	0.00	-26.252	0.00
Flowm	-21.412	0.00	-21.388	0.00	-21.24	0.00

Table A.6 Stationary test-Phillips-Perron Test (Closed Price)

	Constant with trend		Constant no trend		No constant no trend	
Variables	t stat	P-value	t stat	P-value	t stat	P-value
SETOPEN	-45.322	0.00	-45.320	0.00	-45.346	0.00
Flowm	-23.731	0.00	-23.662	0.00	-23.318	0.00

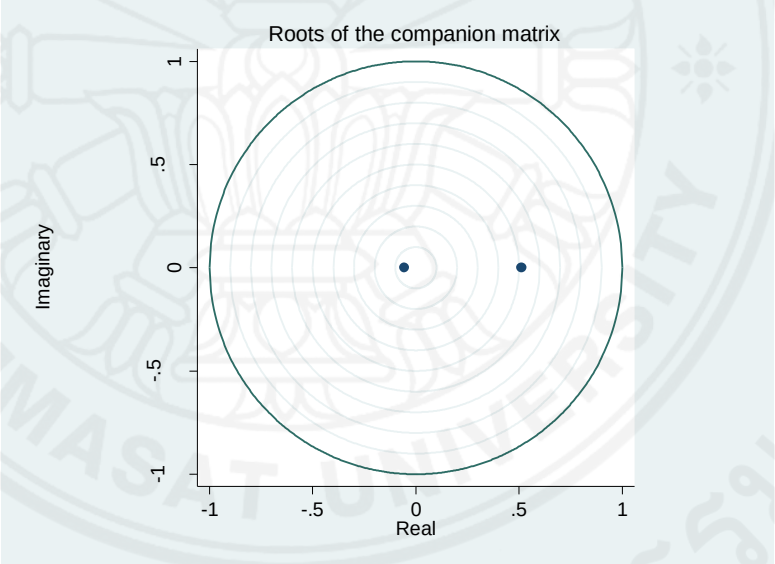
Table A.7 Schwartz Criteria (Open Price)

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-1604	11.8896	8.1514	8.1754	8.2119			
1	-1222	764.62	4	0	1.7510	6.2359	6.2758 *	6.3367 *
2	-1217	9.9311	4	0.042	1.7424	6.2310	6.2869	6.3721
3	-1215	4.1562	4	0.385	1.7595	6.2408	6.3126	6.4221
4	-1209	12.094*	4	0.017	1.7414 *	6.2304 *	6.3182	6.4520

Table A.8 Eigenvalue stability condition (Open Price)

Eigenvalue	Modulus
0.5112	0.5112
-0.0554	0.0554

Figure A.2 Eigenvalue stability condition (Open Price)



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