ASSET PRICING ON THAILAND & MALAYSIA STOCK EXCHANGES: ON THE USE OF MACROECONOMIC AND BEHAVIORAL FACTORS

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Fulfillment of the Requirements for the Degree of
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ABSTRACT

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This thesis tests five macroeconomic variables that have been both theorized to affect stock returns and been proven to do so in past empirical research. Those variables are risk premium, industrial production, term structure, expected inflation, and unexpected inflation. The variables are retested for their statistical significance using four years of monthly contemporary data using Thailand and Malaysia as two of the five ASEAN markets (Singapore, Thailand, Philippines, Malaysia, and Indonesia). Contrary to previous studies, this study finds that the macroeconomic factors were not significant in explaining domestic market returns. Furthermore, principal component regressions outperformed cross-sectional ones, with factor analysis as the least statistically significant model. For the countries tested, the arbitrage pricing theory was also found to be a less robust pricing tool than the proposed sentiment model.

The sentiment model relies on investor behavior, using four investor groups (local, foreign, institutional, and dealer's accounts) on the Stock Exchange of Thailand (SET). The daily net purchases of each group are used as leading indicators for sentiment. The sentiments are examined with relation to each other and market returns. Eight proven macroeconomic factors with known cross-sectional relationships and known to forecast with returns are examined as a benchmark for the newly proposed sentiment factor model. Retesting the factors allows for an apples to apples comparison with the proposed sentiment factors. Using a VAR framework this research finds that dealers predominantly sell to institutional accounts, creating a negative correlation between the two groups, in addition to strong institutional herding which is all indicative of potential agency problems on the exchange. Also find that local individual accounts practice negative feedback trading and the other groups practice positive feedback trading. Of the four groups, the only group that influences the SET is the local individual group of investors. The foreign investor is found to be the least significant group on market returns, provide market liquidity to locals, and be the least responsive to daily market changes-- following the prudent man rule. Lastly, propose a simple model which uses investor behavior to accurately predict the market's direction for the following day 76 percent of the time with market timing ability. This can be useful for buying and shorting the market.

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ABBREVIATIONS AND SYMBOLS

Abbreviations	Equivalence
ACF	Autocorrelation Model
ADF	Augmented Dickey Fuller Test
AIC	Akaike Information Criteria
ARCH	Autoregressive Conditional Heteroskedasticity
CI	Confidence Interval
CUSUM	Cumulative Sums
EG	Engle-Granger Cointegration
FEVD	Forecast Error Variance Decomposition
IRF	Impulse Response Function
JB	Jarque-Bera Test
KPSS	Kwiatkowski–Phillips–Schmidt–Shin Test
LM	Lagrange Multiplier Test
Net	Daily close net purchase
OLS	Ordinary Least Squares
PACF	Partial Autocorrelation Model
PP	Phillips-Perron Test

SEC	Securities and Exchange
SET	Stock Exchange of Thailand
SB	Bayesian Theorem
VAR	Vector Autoregressive Model
VIF	Variance Inflation Factor
VECM	Vector Error Correction Model
ZA	Zivot-Andrews Test

Symbols	**Equivalence**
.1	From 3/24/2006 to 3/23/2011
.2	From 3/24/2011 to 3/23/2016
.l1	Lag 1
.l2	Lag 2
.p	Includes Proprietary
i	Individual group
R^2	Coefficient of Determination
t	Time
X	Predictor Variable
Y	Independent Variable

CHAPTER 1

INTRODUCTION

The current capital asset pricing model (CAPM), which is studied by MBAs and used by CFOs around the world, was devised by Sharpe (1964), Lintner (1965), and Black (1972) (henceforth the SLB model). The SLB model requires one single factor known as the beta to explain all cross-sectional variations of expected returns of an asset. The beta is the covariance of the market portfolio (used as the benchmark) with that of the investor's portfolio, divided by the variance of the market portfolio. Implicitly the expected returns on securities have a linear relationship with beta when the market portfolio is mean-variance efficient. Early empirical tests of CAPM by Black, Jensen, and Scholes (1972) and Fama and MacBeth (1973) supported the CAPM by finding a positive relation between average stock returns and beta with pre-1969 data.

Since the early success of the CAPM, many researchers have found the SLB model to be lacking in stock return predicting power. Reinganum (1981) and Lakonishok and Shapiro (1986) found that the relationship between beta and average returns vanished during the more recent 1963-1990 period. Jagannathan and Wang (1996) find beta does not remain constant from one period to the next and Lewellen and Nagel (2006) further investigate the inadequacy of SLB's beta factor. Ferson and Harvey (1999) and Akdeniz, Altay-Smith, and Caner (2003) propose that beta is a function of observable state variables. Fama and French have spearheaded the attack on the SLB model and propose a three factor model (henceforth the FF model). In

addition to using market returns, they also add a factor for market capitalization (small minus big) and the third factor is the book-to-price ratio (high minus low). Jagadeesh and Titman (1993) found that short-term returns tend to be higher for stocks that had high returns for the previous 12 months of high returns (momentum). Carhart (1997) uses this information missed by the FF model and proposes a four-factor model that extends the FF model by including momentum. The supporters of multifactor models propose that the SLB CAPM does not capture value or price information. The CAPM is not able to explain why small stocks outperform large stocks, or why returns are higher for high B/M and lower for low B/M ratios, or finally why stocks with high returns continue to outperform those with low returns in the previous year.

Countless anomalies and factors have been found to explain cross-section variation as good as or better than the SLB model. In addition to the variables previously mentioned above, sales growth (Fama and French (1996)), labor income growth, and the calendar (French (1980)) have also been found to explain returns. Supporters of the CAPM have disputed their opponents' findings. Lewellen, Nagel, and Shanken (2010) show that even factors with weak correlation with the characteristic the portfolio was sorted on would explain differences in average returns across test portfolios regardless of economic merit underlying the factors.

Also, the three-factor model cannot explain the extension of short-term returns found by Jagadeesh and Titman (1993). The model also misprices small growth and does not work for non-size B/M portfolios. Daniel and Titman's (1997) study suggests that the arbitrage pricing theory (APT) model proposed by Fama and French

(1996) does not hold for portfolios that are double-sorted based on the value and price factors. The FF model also does not incorporate behavioral finance, declining markets, or the results of Merton's (1973) ICAPM. Lastly, using firm-specific characteristics in the FF model has been critiqued by Kothari, Shaken, and Sloan (1995) as suffering from survivor bias. The data source for book equity (COMPUSTAT) has a high number of high BE/ME firms that outlive financial downturns, so the average return for high-BE/ME firms is excessive.

Also those firm-specific factors that are found to be the most significant in the literature (size, value, and momentum) are also the most difficult for practitioners to implement on a market-wide scale. The price-to-earnings (value) ratio is easy to manipulate by management and is also quite volatile from one period to the next. Also the size effect has been found in numerous recent studies to have no effect on returns or at best exhibited periods of negative premiums for the small firm effect. For practitioners, the use of accounting factors that are susceptible to accounting misstatement and currently being disputed by finance research community represents an issue in their forecasting reliability. An advantage of a behavioral model is that in the end the heterogeneous investor beliefs about asset prices will force those prices to be inefficient and the accounting factor models to be unreliable from one period to the next. An advantage of using macroeconomic and/or behavioral factors to explain the cross-sectional returns in the entire stock market is that it is more feasible to implement than attempting to collect all the firm characteristics across the market and weighting the data by market capitalization. These difficulties of accounting factor models and advantages of macroeconomic and behavioral factors are the reasons why the focus of this paper will be on explaining market returns using the latter.

This research expands on Chen, Roll, and Ross (CRR) (1986), Fama (1990), and Ferson and Harvey (1999) by empirically testing the five popular macroeconomic variables they found significant in explaining returns. Additionally, the Dow Jones (DJ), Nikkei (NK), and the local minimum loan rate (MLR) have been found to be significant in forecasting market returns in ASEAN. These three factors along with the author's behavioral factor model will be analyzed and used to forecast the returns for the contemporary Thai and Malay market returns.

In addition to using cross-sectional regression in the analysis of the five popular macroeconomic factors, the multivariate factor analysis and principal component analysis are also used to compress the large amount of data and variables. The same economic variables found to be significant in the previous literature are retested using recent data for two ASEAN markets. In order to verify the significance of past macroeconomic factors, not only should the factors be tested in different time periods, they should also be tested in different markets as well. The variables are analyzed to see if they are correlated with the sets of components extracted from the principal component analysis and to see if they explain returns. Testing of the macro factors' robustness using the period of 2012 to 2016, across the two ASEAN emerging economies is an added contribution this study makes. After testing the economic factors' ability to price market returns, this study also extends the CAPM versus APT debate by testing APT using a multivariate framework in the two different countries.

Behavioral Factors

In addition to the previous literature's findings of significant factors in explaining market returns, the author proposes their own sentiment factors. The supporters of factor models, opposed to CAPM's beta, suggest the factors are due from either risk or investor behavior. The risk stems from both economic and country risks that change the investors' outlook for the market. The risk premium, industrial production, term structure, expected inflation, unexpected inflation, Dow Jones, Nikkei, and local minimum loan rate factors are used to capture the market risk element. The inclusion of the behavioral factors allow for a comparison between the two theories.

In this research, the dynamics of Thailand and Malaysia's investor groups and the relations to the market index returns (Stock Exchange of Thailand and Bursa Malaysia) are analyzed using a multivariate framework. The aggregated daily net purchases and imbalances of four investor groups are used to represent that type of investor's sentiment. The four sentiment groups are local (also referred to as retail), foreign, institution, and dealer (also referred to as proprietary). It is of interest to analyze if the macroeconomic risk factors or the behavioral factors are more significant in explaining returns in the two ASEAN markets. Regarding the use of behavioral factors in asset pricing three questions are explored using contemporaneous correlations, vector autoregressions, Granger causality tests, simulation of impulse response functions, and logit regression. (1) Are there differences in the trading behaviors of the different types of investors? In other words, do the different groups have different techniques and trading strategies that could make some groups outperform others. (2) Do any of the trading groups "cause" each

other and/or the market to move or do they merely follow market movements? If for example institutional and dealer caused each other there could be agency problems. Or if there was a one-way causation between foreign and local trading, it could be from an information advantage due to advanced algorithmic trading or a home team advantage (Dvorak (2005)). Regardless of if a group represents the smart money or not, if the participants within a group are herding their impact on the market is just as important. It would be evident from the investor imbalance ratios detailed in the methodology chapter if a group was herding. Using multivariate Granger "causality" tests and simulated impulse response functions the potential impacts the groups have on each other are analyzed. If there exists a sign of institutional herding, a negative relationship between institutional and proprietary traders, and/or if the institutional group "causes" or impacts the trading (impulse response) of proprietary traders then this would support the existence of agency problems. It is thus of importance for potential investors to understand group trading behaviors. This leads the research to the last and perhaps most important question (3). Is it profitable to mimic and/or forecast the behavior of any of the investor groups (does sentiment predict returns)?

Motivation

"Institutions are herding animals. We watch the same indicators and listen to the same prognostications. Like lemmings, we tend to move in the same direction at the same time. And that, naturally, exacerbates price movements."

-Wall Street Journal, Oct. 17, 1989

There are two sides of the debate for what generates anomalies in the cross-sectional expected returns, risk-based explanations versus behavioral biases. This theoretical debate has real world implications for investors. Therefore, analyzing how

well macroeconomic and sentiment factors explain returns will not only further the asset pricing debate among academics but will also allow practitioners to act on the results to improve their market timing and dynamic forecasting abilities. Standard explanations for behavioral biases are often rooted in momentum trading. In this section the motivation and framework are developed. The three hypotheses in the introduction section are established by discussing the psychology behind how sentiment can affect asset values.

Momentum trading can be explained behaviorally from an under-reaction bias by investors. New information is released and instead of seeing an immediate price jump to adjust to the new value, there is a gradual trend over time to the new correct price. This under-reaction behavior may stem from two different psychological explanations, anchoring and the disposition effect. *Anchoring* occurs when investors stick to some point of reference for valuing an asset, regardless of its relevance. When the historical prices of the stock are lower than the current trading price, investors falsely associate or "anchor" the current value with the value prior to the new information (Zaremba and Shemer (2017)). The *disposition effect* is a psychological process that has investors selling gains too fast and holding losses too long. These two behavioral phenomena may cause the under-reaction that in turn creates a gradual upward trend in price known as momentum (Zaremba and Shemer (2017)).

Two additional causes of momentum may come when groups of investors herd together to trade in the same direction or simply react to lagged returns and practice feedback trading. *Herding* often occurs when investors make the same bets regarding recent events or new information and plays a pivotal role in behavior finance models. Herding behaviors stem from investors believing many people cannot be wrong about

an investment. This may push investors to buy or sell when other members of the group are, which only serves to reinforce the trend (Zaremba and Shemer (2017)). Unfortunately, herding specifically by institutions has been found to be a symptom of agency problems (Lakonishok, Shleifer, and Vishny (1994)). Aside from collusion an agency problem exists where institutions try to herd customers to buy "glamour" stocks based on good past performance to generate more commissions (Chan et. al (1996)). *Feedback trading* occurs when the investor profits when the market is moving up and therefore confidently continues buying or likewise the investor experiences falling returns and loses confidence and therefore continues selling (positive feedback). Its opposite is negative feedback, in which investors follow a contrarian strategy (buy low and sell high). Both types of feedback trading may habituate the direction of the market, thereby creating a trend.

Economists have long since challenged the efficient market hypothesis, stressing behavioral elements of stock market returns. Prior studies that have investigated the strategies and trading behaviors among investor groups concluded there were differences. Although there have been numerous studies on the investment behavior of specific investor groups, this study is unique in that in addition to the trading of investor behaviors, it explores the "causality" and impact between the groups' behaviors and with that of the stock market. Most importantly for the literature, it explores the possibility of using the daily investor sentiment to predict tomorrow's direction of the market.

Different investor groups may demonstrate dissimilar investment behavior meaning they react differently to changes in asset price. Over a ten-year period from 3/24/2006 to 3/23/2016, this paper simultaneously analyzes the relations between four

different investor group net purchases and stock market returns in Thailand. Daily data from 10/1/2009 to 3/23/2016 is used for the three Malaysian groups, local retail, local institutions, and foreign. A brief analysis of the relationships in Malaysia is performed using correlations, granger-causality, and impulse response simulations to substantiate the differing characteristics between Thailand. The differing nature between the two markets allow for robustness when the logit forecast (sentiment model) was tested in both markets. Thailand and Malaysia represent a sample of two of the four possible developing ASEAN markets. This study excludes Indonesia, and the Philippines for lack of data. Thailand and Malaysia were also identified by the World Bank as “tiger cub” economies.

CHAPTER 2

LITERATURE REVIEW

Macroeconomic Factors

The World Bank had identified the two ASEAN countries, Thailand and Malaysia, as Asian "tiger cub" economies. Also of the listed "tiger" economies, Thailand and Malaysia are the only ones with publicly accessible investor group behavior. Included in the ASEAN "tiger cub" developing stock markets there also exists Indonesia, Vietnam, and the Philippines. In 2016 the ASEAN members had reduced economic trade barriers within member states. This recent free-trade development is expected to further benefit Thailand and Malaysia's "tiger cub" economies. These two markets are thus used as the representatives for the ASEAN region.

Chen, Roll, Ross (CRR) (1986) used monthly USA macroeconomic data and found five of the nine factors they tested to be significant in explaining portfolio returns. CRR's study found unexpected and expected inflation to be weakly explanatory and to become more significant when used during periods of high volatility. Industrial production was found to change in risk premiums with a twisting yield curve and was highly explanatory. Risk premiums had a positive sign, reflecting value on insuring against risk and term structure placed a higher value on assets whose prices increase when long rates decline and carry negative premiums. Consumption was never found to be significant and oil became insignificant post-1968 (OPEC was born).

Fama (1990), found in the USA that dividend yield, term spread (spreads high around business peaks), and default spread (high spread indicates a poor business climate) explain 33 percent of returns. By adding a fourth variable, industrial production growth, the explanatory power increases to 58 percent. The empirical results also found spread and dividend yield to capture the same variation in stock returns and to be serially correlated with each other.

Ferson and Harvey (1999) used USA economic variables to reject the FF three-factor model and the four-factor model of Elton, Gruber, and Blake (1995). The difference between the one-month lagged returns of a three-month and a one-month Treasury bill (Campbell (1987) and Harvey (1989)), the dividend yield of the S&P 500 index (Fama and French (1988)), the default spread between Moody's Baa and Aaa corporate bond yields (Keim and Stambaugh (1986); Fama (1990)), the lagged value of a one-month Treasury bill yield (Fama and Schwert (1977); Ferson (1989); Breen, Glosten, and Jagannathan (1989)) were all variables used in Ferson and Harvey's (1999) paper.

Other studies attempting to find factors to explain market returns in ASEAN have tested: Nasdaq; Dow Jones; S&P 500; Nikkei; Hang Seng; Straits Times; Industrial Index; gold prices; oil prices; local minimum loan rate; and exchange rates of the USD, JPY, HKD, and SKD with the local currency. The Dow Jones (DJ), Nikkei (NK), and the local minimum loan rate (MLR) were found to be the most consistently significant factors to explain ASEAN markets in numerous studies. However, in the forecasting of the market returns in the ASEAN tiger cub economies, it has not yet been performed, providing another literature contribution for this paper.

There have only been a handful of non-peer reviewed works and thesis papers by local academics and their students.

Behavioral Factors

Theoretical Research

The field of behavioral finance, theoretically and empirically, challenges the efficient market hypothesis. In an attempt to provide the theoretical framework for behavioral finance a few models have been presented by past researchers, of which two are summarized. Barberis, Shleifer, and Vishny (1998) present a theoretical model of investor sentiment. There model attempts to explain under and overreactions to positive and negative news. They devise that investors believe earnings switch between two different regimes. In the first regime earnings have mean reverting properties and in the second regime earnings tend to continue to rise (fall) after an increase (decrease) with trending properties. Another study links investor psychology and security market under and overreaction. Daniel, Hirshleifer, and Subrahmanyam (1998) link an investor's confidence to the success of their previous actions, thereby incorporating momentum in their model. If, for example, an investor buys an asset and later receives a positive signal from their choice, their confidence is strengthened which creates an overreaction and a momentum effect is observed.

Empirical Research

Research Question 1: Are there distinct trading behaviors?

Different investor groups may demonstrate dissimilar investment behavior meaning they react differently to changes in the asset price. Over a ten-year period from 3/24/2006 to 3/23/2016, this paper simultaneously analyzes the relations

between four different investor group net purchases and stock market returns in Thailand. The first question (1) examined in this study is whether any of the groups are practicing a form of negative (contrarian) or positive (momentum) feedback trading and do any groups appear to perform better than others?

To study this question empirical examinations of contemporaneous correlation of trade imbalances and asset returns have been used of varying frequencies and markets. Quarterly data had been used by Brennan and Cao (1997); monthly data was used by Bekaert, Harvey and Lumsdaine (2002), Dahlquist and Robertsson (2004), and Ulku and Ikizlerli (2012); weekly frequency data used by Karolyi (2002); and daily data was used by studies such as Froot, O'Connel and Seasholes (2001), Chayawadee (2003), Griffin, Harris, and Topaloglu (2001), and Richards (2005). Not only has the question been studied using different data frequencies, but also in different markets. Some of the countries include Brennan and Cao (1997) for the US; Grinblatt and Keloharju (2000) using data on Finland; Dvorak (2005) for Indonesia; Griffen et al. (2004), South Africa; Ulku and Ikizlerli (2012), Turkey; Karolyi (2002), Japan; and Chayawadee (2003), Thailand. Regardless of the data frequency or market used, the aforementioned studies conceded that foreigners display positive feedback trading and/or locals demonstrate negative feedback trading.

However, a select few studies including Hamao and Mei (2001) (Japan) and Hau and Rey (2004) (six biggest equity markets) find foreign traders actually perform negative feedback trading (selling when markets rise and buying when they fall). This strategy was hypothesized as "portfolio rebalancing" which moves money out of assets that have appreciated and towards those that have depreciated to achieve the optimal portfolio balance.

Two studies by Grinblatt and Keloharju (2000), using data on Finland, and Froot et al. (2001), using 44 countries, found foreign investors to outperform other investor types. Boonvorachote and Panyawattananon (2012) also found from 2006-2010 that the foreign group in Thailand outperformed the other groups. However studies by Brennan and Cao (1997) for the US, and Dvorak (2005) for Indonesia, found foreign investors to underperform against domestic retail investors with no apparent information advantage.

In regards to the behavior of the institutions within US and European markets, Wermers (1999) found empirically that they practice short-term positive feedback trading, which is known to be destabilizing in the long-run. Grinblatt, Titman and Wermers (1995), Nofsinger and Sias (1999), Griffin, Harris, and Topaloglu (2001), and Sias, Starks, and Titman (2001) also all document a positive correlation between institutional trading and stock returns.

Pertaining to research concerning Thailand and investor behavior, there are only four other studies in addition to the two previously mentioned studies. In an event study by Tirapat and Chiarawongse (2008), they examine retail, institutional, and foreign investors on over 200 individual Thai stocks during volatile markets. Their study found that the retail (local) investors account for more than 70 percent of the overall trade value of the market. Their study found no evidence of investor group overreactions. They also found that the retail investor would sell when markets had extreme upward movements and buy with market downturns. The other two groups exhibited the exact opposite behavior. This finding suggests that the retail investors are contrarian and the other two groups are using momentum based strategies. Wang (2004) had already found the retail investor to be contrarian and the foreign and

institutional groups to demonstrate momentum patterns in Thailand and that their behaviors were unchanged before, during, and after the 1997 Asian Crisis. Phansatan et al. (2012) findings of the Thai market also confirms the two earlier papers on Thailand. Their study also found that 80 percent of the volume and 70 percent of the value in the trading is by the retail (individual) group. Using contemporaneous weekly data on the top 50 companies from 1999 to 2004 the Phansatan et al. (2012) study also found foreigners to be momentum and individuals to be contrarian. However, they found institutions and proprietary traders to be contrarian not momentum, opposite the event study findings by Tirapat and Chiarawongse (2008).

The fourth and final study pertaining to investor groups in Thailand is another Thai individual stock event study. Chantananugool (2015) found using cumulative abnormal returns that local (retail) investors react in the opposite direction of institution and foreign investors to upgrade/downgrade news. This again coincides with the original findings in 2004 by Wang in which he found retail investors trade in the opposite direction of both institutions and foreigners. Chantananugool's (2015) study used an event window of [-1,+1] and found that downgrade recommendations were met with more extreme abnormal returns than an upgrade. Given a stock downgrade, retail investors would buy and the foreign and institutional traders would sell. Also, a change in recommendation would create higher abnormal returns if it was issued by multiple analysts. Additionally, institutions react earlier than the other groups to sell 'underperform' stocks, which would support that foreign investors are at an information disadvantage.

Finally, Tirapat and Chiarawongse (2008) concluded their research stating that retail investors have a negative relationship with prices, buying when the market goes

down on the event days during extreme volatility, and they "seem" to impact the prices more than the other two groups. The literature thus leaves it for this paper to explore further upon the inconclusiveness of past research.

Research Question 2: Do any investors impact each other or the market?

Various studies, including Hamao and Mei (2001), have been conducted to address the second question (2); do any of the investor groups impact the market returns? This question has implications as to whether the foreign group is "hot money" manipulating the markets and taking advantage of retail investors with superior investment technology. The presence of foreign investment barriers in Thailand suggests that government policy makers have serious doubts over the long-run benefits from foreigners. At one time in Thailand, foreign investment was even segregated to a different class of shares which were traded on a separate exchange.

Many studies have looked at the consequences of foreign group manipulation on market returns. Griffith-Jones (1998) revealed that a large amount of short-term investment into a small market could lead to negative economic consequences on the market and exchange rates. Bhagawati (1998) found that if foreign investors pump vast amounts of funding into the market only to quickly pull out, it could create an unstable economy which increases inflation rates, hurts local export businesses and reduces the current account balance.

Research Question 3: Does sentiment predict returns?

If the co-movements of the investors' buying/selling behavior with the direction of the market is consistent, then knowing the behavior of the investor groups could possibly be used to forecast the market. Past studies typically have used order flow, buy/sell imbalances, and trading volume measures as proxies for investor

sentiment to relate to asset returns (Kaniel, Saar, and Titman (2008) and Burghardt, (2011). Badrinath, Kale, and Noe (1995) and Sias and Starks (1997) demonstrate that group specific ownership did relate to patterns in stock returns. Badrinath, Kale, and Noe (1995) provide evidence that informed institutional traders' past returns on stocks are positively correlated with current returns for non-institutional uniformed traders' stocks. Sias and Starks (1997) extended the January effect anomaly to investigate between individual and institutional investor groups. To address the third (3) question as to whether or not it is advantageous to use any of the investor sentiment to anticipate the stock market, three previous studies found no significance with their forecasting models. Again the past studies present a research opportunity for this paper to contribute to the asset pricing literature. In a study by Hamao and Mei (2001) they used monthly net purchases of various groups in Japan from 1974 to 1992. Using VAR models of differing lags, their article found the groups were not significant in explaining market returns and therefore not a useful predictor variable. A second study by Brown and Cliff (2004) also used a VAR model to study the relation between investor sentiment and near-term market returns. Though they found strong contemporaneous correlations, they unfortunately did not find sentiment to have any forecasting power of asset returns. A third study by Boyer and Zheng (2008) used quarterly US stock market returns and net purchases of various groups from 1952 to 2004. They also used a VAR setup and found poor results of investor flows being able to forecast stock market returns. They conclude by recommending future research "shed light" on the relations between investor purchases and market returns using higher frequency data.

This study contributes to the literature by using the higher-frequency daily data to see if any groups impact the market and by also considering the simultaneous effects of the four different investor groups. This study also seeks to examine if the market can be significantly predicted using the public information of the investor group trading behaviors. The daily net purchases (flows) are used as highly responsive indicators of each type of investor's sentiment towards the market.

CHAPTER 3

DATA AND METHODOLOGY

To reiterate what was said in the introduction, this study uses five macroeconomic factors from influential arbitrage pricing theory studies along with the top three factors found to forecast market returns in the two ASEAN nations. This data are then examined in relation to investor group behaviors from both Thai and Malaysian markets.

Macroeconomic Factors

Five popular macroeconomic monthly variables are used from the two ASEAN countries **(**Thailand and Malaysia**)** to regress on their individual country market exchanges**.** This gives a total of 10 factors spanning from April 2012 to February 2016 **(**47 months**).** The variables tested are a set of economic variables theorized and empirically proven to be significant in capital market returns**.** The variables are expected inflation, unexpected inflation, industrial production, risk premiums, and term structure, which are believed to impact on future real cash flows from capital investments**.**

This study contributes to APT by investigating if the macro variables found by CRR (1986) are still significant years later, or if the previous findings, now widely known, have changed the dynamics of the factors relationship with returns. Southeast Asian exchanges are also used to evaluate if the macro factors from different developing economies on the opposite side of the world, from the USA, also explain returns in their respective markets. Replicating the research methods in CRR (1986)

for the study's 30th anniversary to ensure if the factors can be applied to the two developing markets in Southeast Asia (ASEAN). A four-year window was chosen as companies and markets are constantly evolving and practitioners are more likely to use four years than 30 years of data in calculating the cost of capital or measuring a fund manager's performance. Today's foreign direct investment and big institutional traders make ultra-short bets. Also in the developing markets of Asia, macroeconomic data prior to 2012 is unattainable in many of the markets.

It is of contribution to see how robust the macroeconomic factors are when used in Asia as this may have policy implications for the development of their markets**.** For a macroeconomic variable to be considered meaningful for the multifactor literature studies, it should be significant within other samples and not a result of selection bias**.** For example, Burmeister, Roll, and Ross **(**1994**)** identified inflation to be significant in the US, Japan, Germany, the United Kingdom, and France over a long horizon**.** This study updates the previous research using contemporary data for the new emerging markets **(**Thailand and Malaysia**).** In addition to the cross-sectional and factor analysis methodology used by CRR **(**1986**)**, this study also implements principal component analysis to test arbitrage pricing theory**.** The summary statistics for the monthly macroeconomic analysis can be found in the appendix **(**Table 55**).**

Expected Inflation (EI)

$$E[I(t-1)]$$

The expected inflation was captured from Bloomberg's consumer price forecast index. The data is extracted from the individual country's Treasury bill rates

and follows the methodology of Fama and Gibbons (1984). Inflation was theorized to impact on the market as it influences future cash flows and the discount rate.

Unexpected Inflation (UI)

$$UI(t) = I(t) - EI[(t) \parallel t-1]$$

I(t) is the natural log relative of the Consumer Price Index for the current and previous period. $EI[(t) \parallel t-1]$ is the expected inflation of period t, forecast on period t-1.

Industrial Production (IP)

$$IP = Ln[IP(\mathrm{t})] - \mathrm{Ln}[\mathrm{IP}(\mathrm{t}-1)]$$

IP is industrial production during the month. To derive the monthly industrial production growth (IP), apply the natural log to industrial production of the current period [IP (t)] and subtract with the natural log of the previous period [IP (t-1)]. Another way to calculate this is to do the natural log of the relative industrial production of the current and previous periods. Industrial production was theorized to impact on the market as it affects future firm cash flows and employment.

Risk Premiums (RP)

$$RP(t) = Baa\ and\ under\ bond(t) - LGB(t)$$

Data on Baa and under bond (t) was obtained from the Baa bond index. Bloomberg uses a different rating system, though Bloomberg's BBB rating is equivalent to the Baa used in the previous literature.

The long-term government bond (LGB) is the local government bond rates with 20 years maturity. The difference between the riskier and safer bond rates are used to establish the influence risk has on the market.

Term Structure (TS)

$$Term(t) = LGB(t) - TB(t-1)$$

Long-term government bond (LGB) is the same data used to calculate risk premiums, which may increase the correlation between the two variables. The current LGB period is used and subtracted by the Government Treasury Bill of the previous period. The standard Treasury Bill with one year maturity is used. The difference between the rates on long-term and short-term maturities indicates the market's valuing of payments far in the future versus in the near term.

Stock Exchange Return

$$Rj(t) = Ln\left[\frac{Pj(t)}{Pj(t-1)}\right]$$

In the market return calculation, R is the market return, j is the exchange, and P is the closing price. Market return data is weighted by the standard market capitalization method. This may be a limitation of this study because using equally weighted portfolios, instead of market capitalization, was found to increase the significance of multifactor pricing models by Bartholdy and Peare (2004). There are two country market indexes used for the dependent variables in their separate country regressions. The country indexes are Thailand's (TH) SET and Malaysia's (MA) MYX. The monthly prices are calculated by using the last trading period of the data and converting it to monthly. The latest date is used in instances where the last day of the month is not available. Then, the natural log of current over the previous period is used to get the portfolio (time continuous) returns.

The correlations of each market's five economic variables, market index, and multivariate derived component are shown in the appendix (Table 54). The

components are 13 to 31 percent correlated with index returns in Malaysia and Thailand. RP correlations overall did well with index returns. EI and UI are highly correlated with each other, as expected, since they are derived using shared data. This is also true of RP and TS being highly correlated. The collinearity present within these series may weaken the individual significance of a factor. The regressions are also modeled with stepwise omissions to see if it impacts on factor significance.

Table 56, in the appendix, displays the autocorrelations (serial correlations) of the economic variables for each of the six markets tested. Based on the Box-Pierce statistics all the macro variables except industrial production (IP) exhibit serial correlation. The IP series was strongly found to have independent residuals. For the most part, the size of the estimates are largest at the first two lags and again at the last two lags. This creates a wide U-shape effect and is suggestive of seasonally correlated time series data. The autocorrelation in the variables will bias the loadings of index returns on these variables and will reduce their statistical significance.

Macroeconomic Factors: Methodology of Arbitrage Pricing Theory

The arbitrage pricing theory (henceforth APT) is a replacement for the capital asset pricing model (henceforth CAPM) and was developed by Ross (1976). It is a one-period model that assumes a linear relation between an asset's expected return and its covariance with some random variables. This is the same design as the CAPM, and in the CAPM the covariance is with the market portfolio's return. A weakness in empirical tests of APT is that the theory does not specify what factors to use. Despite this APT may be used for asset allocation, determining cost of capital, and gauging the performance of fund managers. In application, however, the APT is often not used in favor of the CAPM. For example, the Utility Commission of New York State

denied the proposals of various APT models and opted to use the simpler CAPM. The US Federal Reserve Board also declined to use APT to compute the cost of equity for various priced services at Federal Reserve Banks. According to DiValentino (1994) and Green, Lopez, and Wang (2003), the above-mentioned government organizations did not use APT because the current research uses a wide array of factors and the results are consequently non-conclusive.

There are three prominent approaches for finding factors to test APT. The first is the utilization of economic theory to find a set of macroeconomic factors to then test if they may affect returns. Chan, Chen, and Hsieh (1985) and Chen, Roll, and Ross (1986) used this approach. The second approach begins with estimating correlation/covariance matrices of factors with the asset returns, then using judgment to select the factors as used by Chan, Hamao, and Lakonishok (1991) and Fama and French (1993). The third and most technical approach is using multivariate analysis, such as factor or principal component analysis (FA or PCA). These multivariate models reduce the dimensionality and serial correlation of the data and then use random scores data as the independent variables. This third approach was used by Roll and Ross (1980), and Chen (1983), and PCA is recommended over FA in APT studies by Connor and Korajczyk (1986). In the selection of the factors used in this study, previous empirical findings, economic theory, correlations, and multivariate analysis conditions were all met.

The multifactor return-generating process can be described as

$$R_i = a_i + \sum_{j=5}^{J} b_{ij} I_j + e_i \quad (3.1)$$

The APT model that stems from the above return generating process can be defined as

$$\bar{R}_i = R_f \sum_{j=5}^{J} b_{ij}\, \lambda_j \quad (3.2)$$

Equation (3.1) is used to estimate the b_{ij}s (component loadings) using regression analysis with the I_js being the components. The I_j used for each country's model is the weighted average of the macroeconomic factors on which the analysis is performed. The APT model is then estimated in Equation (3.2) via attainment of the λ_js. If factor or principal component analysis is not used to estimate the b_{ij}s for testing APT, then the test is really a simultaneous test of the APT and the significance of the hypothesized macroeconomic factors. This study relies on both methods. The multivariate approach tests APT and cross-sectional regression is used to test both APT and the macroeconomic factors simultaneously.

Traditionally, the second step in testing the APT (Equation 3.2) comes from the two-stage Fama and Macbeth (1973) methodology. The cross-sectional test of each of the 47 time periods produces the λ_js and variances that are then averaged. This is the same process followed by Roll and Ross (1980). This process is not without limitations as it suffers from error-in-variables. Because the loadings (b_{ij}s) from the first-step regression (Equation (3.1)) are estimated with error, this, in turn, causes the λ_js to be only asymptotically accurate.

Fortunately, an alternative approach to testing the APT is possible if factors that are known to affect stock returns are used. There is a great debate within the literature where some researchers believe the factors should come from theory and the opposition believes that all the factors should be created from empirical studies (Roll and Ross (1980)). This study is able to appease both sides of the divide. The macroeconomic factors used in this study are quite promising as they were deduced

from theory by Chen, Roll, and Ross (1986) and have been found to be empirically significant in CCR (1986), Fama (1990) and Ferson and Harvey (1999). Because the macroeconomic factors used are specified with a priori, then the estimates of these variables can be measured by Equation (3.3).

$$\bar{R}_i = \lambda_0 + \sum_{j=5}^{J} \lambda_j \, b_{ij} \quad (3.3)$$

This alternative approach is the direct equivalent of the second step of the Fama and Macbeth method and has been implemented in Sharpe's (1982) APT study. The *J* represents each of the five macroeconomic variables, the b_{ij}s are the monthly values of each variable, and the λ_js are the average extra return required by each of the variables.

The components of the multivariate approach are created by multiplying the loadings (weights) with the variance for each country's extracted variable. The data is extracted to explain the greatest amount of correlation. Scores are interpreted as the rearrangements of the data in a context that explains the dataset with fewer variables. A score represents each item related to the component. Loadings are a singular value decomposition that explains the principal components. The positive or negative loading of a specific variable indicates the contribution that variable has to the component.

Of the five variables used in this study, all five are retained in the multivariate model and correlations, lagged autocorrelations, and significance within the regression models are analyzed. Principal component and factor analysis are used to reduce the data and multicollinearity of the factors. Based on the component loadings, proportion of variance each component explains (eigenvalues) the data is reduced to a

parsimonious one component. A component with an eigenvalue less than 1 would explain less variation in the market returns than the original variables. In both the markets, there were large drops in the eigenvalues from component one to component two. The method of using eigenvalues to retain factors is based on the Kaiser Criterion (Kaiser (1960)). Anderson (1984) finds extracting a smaller number of the most relevant factors with the most information in the data set improves the prediction accuracy for macroeconomic variables. The first component regression of the scores on index returns is given in the results. This study used both factor and principal component analysis.

Behavioral Factors

"The evidence in favor of inefficient financial markets is far more compelling than that in favor of efficient ones."

-Subrahmanyam (2007)

Challengers of behavioral finance suggest that the field offers improvised models to explain very specific facts instead of providing a robust general or unified theory. Also that the field is subject to data mining as researchers seek out deviations from traditional finance models. The main crux of the field not meeting the requirements of traditional finance researchers is that it is a "positive" theory that explains how people behave and not how they should behave. Whereas, "normative" theory is based on rational economic models.

Surveys directly measure sentiment by asking people about their expectations. However, using sentiment measures based on surveys has been critiqued because people don't always do what they say, low data frequency, and delays and/or inaccuracies with respondents completing the surveys. Various alternative sentiment

proxies (consumer confidence index, retail store sales, investment sentiment survey, consumer sentiment survey, and business sentiment index) were all examined and found to be not correlated or significant when regressed with returns or market direction. The data frequency for the survey based sentiment measures was either monthly or quarterly over the ten year period. These data frequencies are not well suited for short-term sentiment inferences or consequently forecasting.

Market-data based measures are the alternatives to measuring sentiment based on surveys. Using implied volatility as a function of option prices or a put/call ratio (volume of put option contracts divided by volume of call option contracts) are two types of market-data based measures. The data for these two measures, however, is sparse in the tiger cub economies, does not distinguish between groups, and is bias against retail traders that often do not participate in options trading. However, the group net cash flow and imbalance ratio (which uses the former measure and divides by the group's volume), at the much higher daily frequency, were found to be promising. Therefore, this study uses the end of day net change in holdings for the four different investor groups classified by the Stock Exchange of Thailand (SET). The change in holdings is used as a proxy for that group's sentiment towards the market. Of the four groups, the retail group consists of the local individual investors. The foreign group includes all non-resident accounts, both individual and institutional transactions. The institutional group is comprised of transactions from locally based companies (banks and insurance). The fourth group, proprietary, consists of the same companies in the institutional group; however, they are trading with their firm's own money as opposed to depositors' money. It is important to make a distinction that this study uses aggregated group behaviors and market returns instead of individual stocks

as past Thailand studies have done. Use of the entire market data allows for a complete analysis, whereas using the top 50 stocks, for example, may suffer selection bias. The bias stems from the fact that typical individual investors are known to invest away from large and towards small capitalization stocks. The use of only the largest stocks would thus not be as representative of the group.

The data is organized into three time periods for analysis. The full sample is tested from 3/24/2006 to 3/23/2016. The full sample is then divided into two five-year periods, 3/24/2006 to 3/23/2011 (bear market) and 3/24/2011 to 3/23/2016 (bull market). The summary statistics can be found in Table 1 and Table 2.

Table 1 Summary Statistics (Thailand)

Net Purchases:

3/24/2011-3/23/2016 (Unit: M.Baht)

	Retail	Foreign	Institution	Proprietary
Min	-16840	-16910	-12030	-4374
median	85.07	-103	93.68	-2.78
mean	54.5	-236.6	165.6	16.52
Max	85.07	14480	15690	3982
Sum	66650.77	-289372	202521.8	20199.72

Imbalances:

3/24/2011-3/23/2016

	Retail	Foreign	Institution	Proprietary
min	-0.6875	-0.6881	-0.7364	-0.3042
median	0.0004	-0.0003	0.0076	-0.0007
mean	0.005	-0.0041	0.0137	-0.0201
max	0.3867	0.3395	0.8711	0.4337

Note: Over the recent five year sample, the foreign investors have been selling out of Thailand. Institutional traders exhibited the highest instances of herding,

with up to 87 (73) percent of their total daily volume being from their net positive (negative) cash flows.

Table 2 Percent of Time Daily Net Change is positive (3/24/2006-3/23/2016) (Thailand)

SET	Retail	Foreign	Institution	Proprietary
0.5332	0.5012	0.4840	0.5213	0.4917

Note: The groups are each net buyers just as often as net sellers.

The net changes are expressed in millions of baht and are defined as the total buying less total selling for the day of that group. In addition to modeling using the daily net change of investor groups and daily SET returns, each test is duplicated using the share imbalance.

$$\text{Imbalance}_{it} = \frac{\text{Buying}_{it} - \text{Selling}_{it}}{\text{Total Volume}_{it}}$$

The method for deriving both net and imbalance is very common in research exploring investor behaviors. The method for calculating share imbalance in this study is the same as used by Chordia, Roll, and Subrahmanyam (2011) and Kelley and Tetlock (2012). The imbalance ratio is a direct market-data based on sentiment. The intuition behind the imbalance factor is that there would be a positive predictive relationship between price changes and imbalances. As more traders within group *i* trade in the same direction, the imbalance will increase as the numerator becomes more positively (buy) or negatively (sell) larger. However, as the total volume increases the effect of the net buying or selling becomes more noise in the market, unless the net is also increasing (positively or negatively) in proportion to total

volume. This factor represents the economic forces of supply and demand on price, while simultaneously removing problems of serial-correlation. A number greater than zero means that the group was a net buyer and less than zero it was a net seller. The larger the absolute value of the imbalance ratio is, the more likely that group is herding. Each group has vastly different amounts of wealth invested in the market and in addition, a small net change from a group would have a larger impact on a thinly traded (low volume) day than not. Because of this, the imbalance of each group is also used, duplicating all tests. The regressions using the data transformation imbalances are also used to confirm the interpretations of the vector autoregressions using net change.

A key question for the behavior finance literature is if trading within groups is correlated (herding). If there is empirical evidence of herding found than the efficient market hypothesis assumption that noise traders and/or rational arbitragers counteract correlated trading and cancel each other out is seriously violated. If a group of investors had the same opinion about the market and their trades were correlated it may then be possible for them to influence the market. The typical approach to investigate herding is to examine the net cash imbalance and/or the net cash as a percentage of trading volume imbalance, as was practiced dating back to Kraus and Stoll (1972) and in this study.

In vector autoregression models the regressors are likely to be collinear which increases the standard errors. The collinearity results from the need to have a net buyer in order to have a net seller and is eliminated with the imbalance transformations per the kappa result of 26. Kappa statistics above 30 may suffer from multi-collinearity and thus have increased standard errors resulting in small t-statistics

which may then cause the model to be interrupted as less significant. The variance inflation factor (VIF) test results for each group ranged from 1.1 to 1.7, agreeing with the kappa test as VIF statistics above three may suffer collinearity issues. In general, VAR models by nature are highly likely to exhibit collinearity in the regressors and this does not affect the regression model itself.

3.1 Vector Autoregression (VAR)

The structural VAR model has also been implemented by Froot et al. (2001), Karolyi (2002), Dahlquist and Robertsson (2004), Richards (2005), Ulku and Ikizlerli (2012) and numerous others to examine investor net purchases and returns.

The VAR allows for all the variables in the model to affect each other. It allows for a bi-directional relationship between dependent and independent variables. The variables are modeled as endogenous, allowing for them to influence each other equally. It thus has one equation per variable. In condensed matrix notation, the formula only has one A matrix when one lag is used. Therefore let,

$Y_{1,t} = SET_t$ (Stock Exchange of Thailand)

$Y_{2,t} = Retail_t$ (local individual accounts)

$Y_{3,t} = Foriegn_t$ (non-resident traders)

$Y_{4,t} = Institution_t$ (local dealers trading for banks and insurance)

$Y_{5,t} = Proprietary_t$ (local dealers trading for their own accounts)

$$\begin{bmatrix} Y_{1,t} \\ Y_{2,t} \\ Y_{3,t} \\ Y_{4,t} \\ Y_{5,t} \end{bmatrix} = \begin{bmatrix} C_1 \\ C_2 \\ C_3 \\ C_4 \\ C_5 \end{bmatrix} + \begin{bmatrix} A_{1,1} & A_{1,2} & A_{1,3} & A_{1,4} & A_{1,5} \\ A_{2,1} & A_{2,2} & A_{2,3} & A_{2,4} & A_{2,5} \\ A_{3,1} & A_{3,2} & A_{3,3} & A_{3,4} & A_{3,5} \\ A_{4,1} & A_{4,2} & A_{4,3} & A_{4,4} & A_{4,5} \\ A_{5,1} & A_{5,2} & A_{5,3} & A_{5,4} & A_{5,5} \end{bmatrix} \begin{bmatrix} Y_{1,t-1} \\ Y_{2,t-1} \\ Y_{3,t-1} \\ Y_{4,t-1} \\ Y_{5,t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \\ \varepsilon_{3,t} \\ \varepsilon_{4,t} \\ \varepsilon_{5,t} \end{bmatrix}$$

Each individual variable was tested for stationarity before being put into the levels VAR. The Augmented Dickey-Fuller (ADF), Kwiatkowski–Phillips–Schmidt–Shin *(*KPSS), Phillips-Perron (PP), and Zivot-Andrews (ZA) tests were used. In addition the correlograms were also plotted for visual inspection of unit roots. All the results testing for stationarity indicated no unit root processes. The results are available in Table 3 and Figure 1. In constructing the VAR, due to all the variables being stationary, an unrestricted VAR in levels is estimated. The ADF stationarity and runs tests indicated the data had a trend component. The trend was therefore modeled into the VAR and the likelihood results improved.

It is advisable to make several tests and see if the results match when testing for unit roots; thus, Zivot-Andrews in addition to the Phillips-Perron, KPSS, and Augmented Dickey-Fuller (ADF) tests for unit roots are used. Phillips-Perron (PP) is advisable with heteroscedasticity, but Davidson and Mackinnon (2004) report that PP test performs worse in small samples than ADF and is best suited for large samples due to it being based on asymptotic theory. The PP test is non-parametric, does not require to select level of serial correlation as with ADF. Instead the PP test takes the same estimation as in DF test, but corrects the statistic to conduct for autocorrelations and heteroscedasticity (HAC type corrections). The PP test is also more robust to deviations from “i.i.d.” properties. Though the PP shares disadvantages with ADF, such as, sensitivity to structural breaks and poor small sample power resulting in unit

root conclusions. Because there may be a structural break during the 2007-09 Financial Crisis, the Zivot-Andrews test for unit roots is also used. Finally, in the Kwiatkowski et al. (1992) article it was argued that KPSS works better within small samples (their first experiment was with a sample of 50).

Table 3 Stationarity Test Results (Thailand)

	ADF	**KPSS**	**Phillips-Perron**	**Zivot-Andrews**
SET	0.01	0.1	0.01	0.000796
Retail.Net	0.01	0.1	0.01	2.20E-16
Retail.Imbalance	0.01	0.1	0.01	2.20E-16
Foreign.Net	0.01	0.05141	0.01	2.20E-16
Foreign.Imbalance	0.01	0.1	0.01	2.20E-16
Institution.Net	0.01	0.01	0.01	2.20E-16
Institution.Imbalance	0.01	0.08753	0.01	2.20E-16
Proprietary.Net	0.01	0.1	0.01	0.004274
Proprietary.Imbalance	0.01	0.1	0.01	0.0647
Null Hypothesis	Non-Stationary	Stationary	Non-Stationary	Non-Stationary

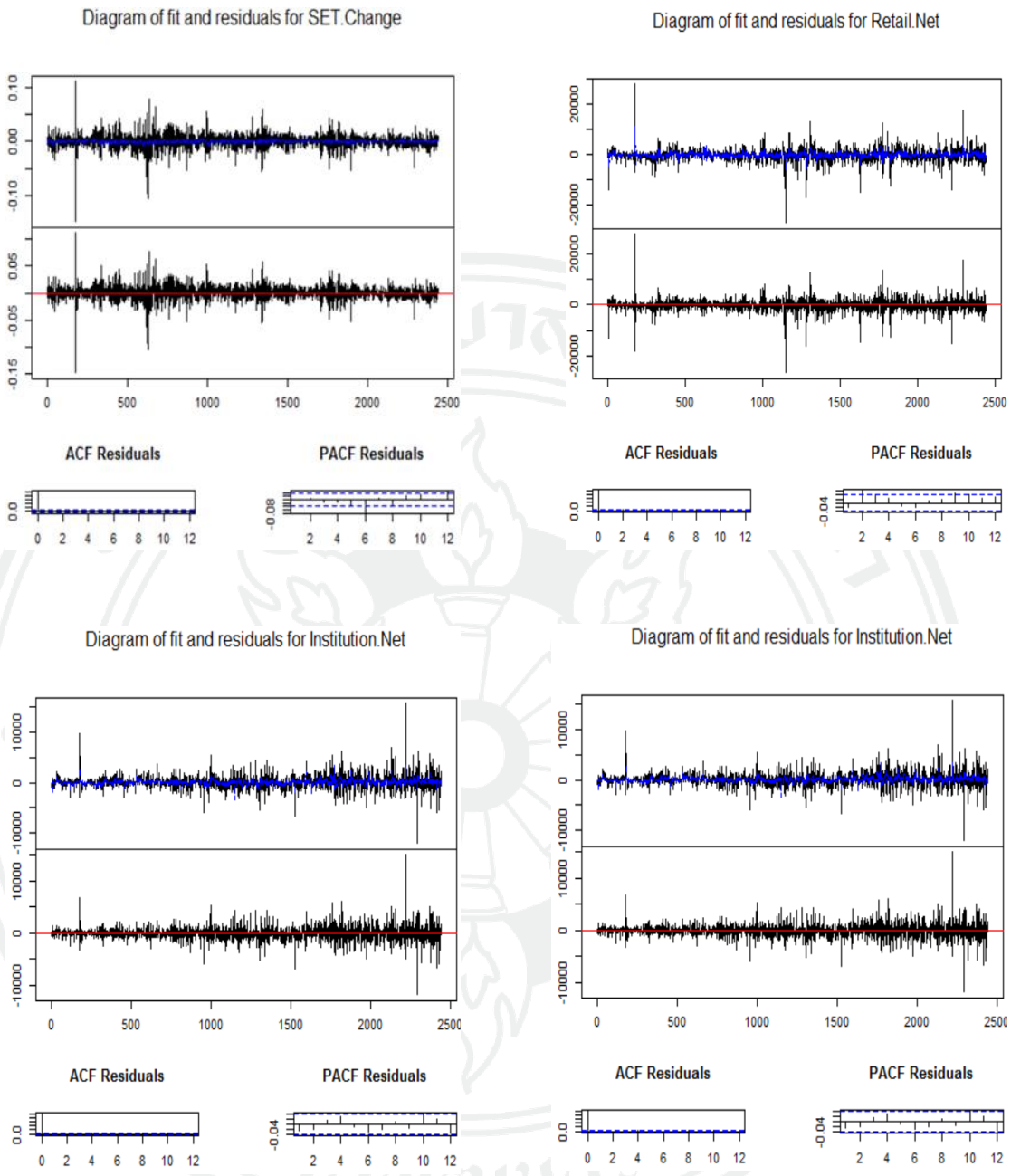


Figure 1 Diagram of Fit with ACF and PACF

Note: The visual inspection reveals the data is stationary as the autocorrelation (ACF) graphs quickly drop off after the first time period with no persistence.

The runs test is important in that if the behaviors are not random then tomorrow's behaviors can be predicted with some degree of accuracy. Given that the

behaviors of the groups are either consistently negatively or positively related to the market, by knowing the groups' behaviors, one can determine the market's direction.

The ordering of the variables was based on the decreasing order of relative exogenity (SET returns, retail, foreign, institution, and then proprietary). This follows the methodology of Enders (2010) and follows a logical causal ordering. The relative exogenity is supported by strength of the contemporaneous correlations with the SET, individual Granger causality tests, and the amount of money each group trades in a given day (market power). The number of lags to include for the VAR is based on the Bayesian (SB) and Akaike information criteria (AIC). The number of lags selected for the VAR models was one. Not using additional lags is also in keeping with the efficient market hypothesis. This means for the VAR(1) model only yesterday's results, and no other previous days, impact today's results. This is logical in that investors must wait and see the closing net change in the various investor groups. The results of the previous day are reported on the SET's official website, but current day activity is not made publicly available.

In diagnostic testing, the VAR models, the stability, normality, and serial correlation are considered. The stability test computes an empirical fluctuation process based on OLS residuals and the process contains cumulative sums (OLS CUSUM). It is apparent over the 10-year sample there is a structural change in the third year of the data, this, of course, being the early 2009 Financial Crisis. When the data is broken up into two five-year subgroups, the problem alleviates itself. Regardless of the 2009 structural change, on the full 10-year sample the stability of the models is far from unity. The moduli of the first eigenvalues are 0.45 on the full sample and 0.42 on the most recent five years. The multivariate normality of the data

is not present. The skewness and excess kurtosis do not match a normal distribution. This, of course, is expected with financial data. The Jarque-Bera (JB) normality test, which was performed, is prone to being overly sensitive and rejecting the null of normality within small samples; however, with over 1000 observations being tested this is likely not an instance of Type I error. The residuals are standardized by a Choleski decomposition of the variance-covariance matrix for the multivariate version. There is also a presence of multivariate autoregressive conditional heteroscedasticity (ARCH-LM) effects. The serial correlation asymptotic tests reveal there is no serial correlation regardless how many lags are tested. The diagram of fit and the autocorrelation (ACF) and partial autocorrelation (PACF) function of the residuals are plotted for each equation in Figure 1.

A restricted model was also constructed, where any t-statistic values in the multivariate model above the absolute value of 2 were withheld. However, the log-likelihood of the unrestricted VAR model indicates a better model fit, and as the VAR will be used in causality and impulse response simulation, none of the coefficients were excluded.

The forecast error variance decomposition (FEVD) is derived to analyze the contribution of each individual variable to the forecast error variance of each equation in the VAR. The squared orthogonal impulse response coefficient matrices are divided by the variance of the FEV and the results are in percentage. The larger the percent the more that variable contributes to the error variance.

3.2 Causality

Recently, Bollerslev et al. (2006) used simple correlations using a high-frequency data-set. This study also used correlations in addition to the Granger test of

(non)-causality and the more advanced multivariate Granger test. The VAR model is used to perform a multivariate test of Granger causality. The multivariate causality test used in this study is that of Tsay's (2014) for the use of high-frequency data. The method of using a multivariate VAR causality test has also been used with daily data to measure causality between volatility and returns by Dufour, Garcia, and Taamouti (2011). To analyze whether investors, aggregated in their respective group, chase after returns or if they affect the market returns through their trading, Granger causality tests were performed. The predictor variable (X) Granger causes the independent variable (Y) if Y can be better predicted using the historical data of both X and Y then only the use of Y. The null hypothesis of the test is no Granger causality. Because all the variables in the VAR are stationary, the simplest way to test Granger causality is to use the standard F-test of the restriction outlined in Enders (2010),

$$a_{21}(1) = a_{21}(p) = 0$$

If the coefficients of $a_{21}(lag)$ are equal to zero to p lags than Y does not Granger cause X.

When testing for Granger (non)-causality a VAR in levels is required. Because all the data are stationary, this study is able to correctly apply the Wald test to the coefficients in causality testing as opposed to the Toda-Yamamoto (1995) approach. A VAR in levels is also the correct model over that of a VECM when testing for causality, even if cointegration is suspected. Clarke and Mirza (2006) found that doing a pretest for cointegration can result in severe over rejections of the null. Toda and Philips (1994) and Dolado and Lutkepohl (1996) conducted Monte Carlo experiments and also strongly advise against pre-test testing. Their simulations reveal adverse results when the second test of causality is really a random mixture of two

tests, which would produce incorrect test statistics. The VAR is recommended for causality testing and cointegration can then be used to cross-validate the results. If the variables are cointegrated then there will always be Granger causality either unidirectional or bidirectional. In addition to causality testing disadvantages of using a VECM, in forecasting with the VECM, it has been found to only improve results over the VAR in long-run horizons. This being a study of investor group flows used in day-to-day forecasting, the advantage tilts towards the VAR (Hoffman and Rasche (1996)). For robustness, pairwise Granger (non)-causality tests were also performed with one thru five lags. As the number of lags increases, the chance for rejecting the null (finding causality) also increases. These are the standard tests using the t-statistics. In addition to the individual pairwise tests, the multivariate approach was also used. The multivariate causality test is more complex as it allows for simultaneous interactions between all investor groups and the results at the 95 percent confidence level are wild bootstrapped 100 times for robustness, following Hafner and Herwartz (2009).

3.3 Impulse Response Function (IRF)

An impulse response function (IRF) measures the effect of a shock on the behavior of a series through time. This model is used in this study to simulate variable-specific shocks to each VAR equation and then bootstrap the responses with 100 iterations at the 95 percent confidence level.

Cholesky decomposition is used to transform the innovations to eliminate problems of correlation with the factors a_t. There exists a lower triangular matrix $\boldsymbol{L}$ such that $\boldsymbol{\Sigma}=\boldsymbol{LGL}`$, where $\boldsymbol{G}$ is a diagonal matrix and the elements of $\boldsymbol{L}$ are unity.

$$\boldsymbol{r_t = \mu + a_t + \Psi_1 a_{t-1} \ldots}$$

$$\boldsymbol{= \mu + LL^{-1} a_t + \Psi_1 LL^{-1} a_{t-1} \ldots}$$

$$\boldsymbol{= \mu + \Psi_0^* b_t + \Psi_1^* b_{t-1} \ldots}$$

, where $\boldsymbol{\Psi_0^* = L}$ and $\boldsymbol{\Psi_i^* = \Psi_i L}$. The impulse response function of $\mathbf{r_t}$ relative to the orthogonal innovations of $\boldsymbol{b_t}$ is represented by the coefficient matrices of $\boldsymbol{\Psi_i^*}$.

The focus of this test is to observe in what manner responses might vary across investor groups given a shock to the stock market. Another focus is to illustrate how a shock created within an investor group causes them to react positively or negatively from one lag to the next and their impact on the market. A positive shock to a group that is then preceded by net selling could be interpreted as over-correction or short-term profit taking behavior. Finally, the IRF will be used to see how the groups react when other groups experience a positive shock to the system, by selling to or buying with each other.

The impulse response coefficients are obtained from the least square estimates of the VAR. Using the maximum autoregressive lag of one (following the aforementioned VAR methodology), the model draws 100 times (bootstrap) from the joint distribution of the innovations at each history to produce 100 realizations of the shock for each weight. On the full ten-year sample, 2,442 observations are used to generate 244,200 realizations of the impulse response function. The shocks taper off after two to three lags. Increasing the lags in the VAR models did not change magnitudes, persistence, or direction of the impulse time paths; however, as the lags increase from 1, 2, 3 to 4 lags, the time path is less linear (wavier). When the number

of lags increased in the VAR model from 4 to 10 lags, the coefficients remain unchanged.

3.4 Logit Regression

Unlike the VAR models, the dependent and independent data used in the logit regressions take on binary values. The values are a zero (0) for negative market returns and group net purchases and a value of one (1) for positive market returns and net purchases. The logit and probit models are estimated using the maximum likelihood method. Wherein a positive (negative) coefficient sign, on a group's sentiment, indicates the event that the market goes up (y=1) is more (less) likely to occur when that group has positive flows.The following sentiment model is proposed:

$$P(SET_{t+1} = 1|x) = G(\beta_0 + \beta_1 Retail_t + \beta_2 Foreign_t + \beta_3 Instituion_t + \beta_4 \text{Proprietary}_t)$$

, where G is a logistic function taking on values between zero and one for all real numbers *z*:

$$G(z) = \frac{\exp(z)}{[1 + \exp(z)]} = \Lambda(z)$$

Therefore $SET_{t,1}$ is a series of out of sample predicted probabilities between zero and one based on the cumulative distribution function of the logistic distribution. A

predicted value more than 0.5 indicates that the stock market will go up (1), otherwise, the prediction is for the market going down (0). The AIC, McFadden R^2, out of sampling forecast accuracy are used to measure the performance of the model as well as comparing what the investor's results would have been had they traded using the predicted market directions. This is measured with two market timing tests and a comparison using modified-Sharpe ratios and summary statistics between a strategy of 'buy and hold' versus a market timing strategy using the predictive sentiment model.

Not only was the sentiment model tested using the full 10-year and two five-year subsample periods (across time) in Thailand, but the model was extended to the Malaysian markets. In Malaysia, the daily group cash flows for retail, institutions, and foreign was used for the period of 10/1/2009 to 3/23/2016.

The performance of a portfolio implementing the sentiment (logit) model to forecast the market, in Thailand, will also be compared to a portfolio strategy of buy and hold. The summary statistics of the returns and the Sharpe ratios of the two portfolios will be compared. Additionally, the market timing of a fund manager using the sentiment model is analyzed using the traditional Henriksson-Merton and Treynor-Mazuy models.

Henriksson-Merton,

$$\mathrm{Ri} - \mathrm{Rf} = \alpha + \beta(\mathrm{Rm} - \mathrm{Rf}) + \gamma \mathrm{D} + \varepsilon \mathrm{p}$$

Treynor-Mazuy,

$$\mathrm{Ri} - \mathrm{Rf} = \alpha + \beta(\mathrm{Rm} - \mathrm{Rf}) + \gamma(\mathrm{Rm} - \mathrm{Rf})^2 + \varepsilon \mathrm{p}$$

Market timing in this study is the act of switching between long/short on the market based on the retail sentiment predictive model. Because of difficulty to predict the direction of the market, fund managers typically underperform investors who stay in the market (buy and hold). The performance results do not include transaction costs. Two different market timing tests are used. The additional term to the CAPM in the Merton-Henriksson test ‘D’ is zero (0) when the market is negative and one (1) when the market is positive. Whereas the Treynor-Mazuy test is a quadratic expansion of the CAPM which accounts for the manager buying when they anticipate the market to increase and selling otherwise. If the gamma in the additional term is positive than the equation describes a convex upward-slopping line. When the gamma from either model is greater than one, it demonstrates the fund manager has market timing abilities.

CHAPTER 4

RESULTS

In this chapter the results are detailed for the reader. In summary, the well-known asset pricing macroeconomic factors and the macroeconomic factors found in previous studies to have had a strong forecasting relationship with the Stock Exchange of Thailand were inferior to the behavioral factors used in this study. Using the behavioral factor model developed in this study, the researcher was able to predict the market direction at $_{t,1}$ with 75 percent accuracy. Furthermore, a practitioner implementing the proposed sentiment model would exhibit market timing capabilities with a higher Sharpe Ratio than an investor who merely bought and held onto a market index.

Macroeconomic Factors

The multivariate tests indicate that arbitrage pricing theory is not an effective asset pricing tool in the Malaysian market. This market is also the least westernized market from of the sample. In the Thailand market, the principal component had a negative pricing effect with the market returns. This follows economic theory in that the unanticipated term structure, unanticipated risk premiums, and inflation forces contained within the component would have a negative impact on market returns. However, in a study by French (2016), tests of the CAPM using the Fama-MacBeth and generalized method of moments (GMM) revealed the CAPM to be significant within the Southeast Asian markets. The Fama-Macbeth $\hat{\alpha}$ t-statistic was 5.0064 and $\hat{\lambda}$ was 6.0998. The more robust GMM Gibbons-Ross-Shankaen (GRS) test had a chi-

squared (x^2) statistic of 6.1097. The tests, therefore, reveal that the single-factor CAPM is empirically more robust than the macroeconomic APT.

The multivariate analysis demonstrates that arbitrage pricing theory is not an effective asset pricing model, as it was found to be either insignificant (Thailand) or the wrong sign (Malaysia); therefore not robust in ASEAN markets. The tests reveal only risk premium in Malaysia and the component of the five factors in Thailand were significant (see appendix Table 57). When the term structure and inflation factors were removed from the model, risk premium lost its significance (see Table 57, model (2)). Therefore none of the five prominent macroeconomic factors were found to be meaningful. Cross-sectional model (3) in Table 57 consists of the three most promising economic factors found in previous ASEAN market forecasting studies. The minimum loan rate was found to be the most significant in both markets. This is somewhat problematic for practitioners trying to actively forecast, as the MLRs are often left unchanged for years. Based on the correlations, in Table 54, the most promising factor from each category (sentiment, macroeconomic and ASEAN market forecasting) were used in model (4). In Thailand, the expected inflation had the wrong sign and none of the factors (EI, MLR, and retail) were found to be significant at the monthly frequency. However, in Malaysia, the sentiment factor (institution) was found to be significant at the ten percent level, whereas risk premium and MLR were not significant.

This is of importance for both practitioners and contributes to the theoretical studies in asset pricing. Chen et al. (1986) also found the risk premium to be their most noteworthy economic variable of significance as well. In Table 57 all the variables are used and only risk premium was found to be significant. Variations were

also tested, omitting variables, in an effort to improve the two variables for inflation, but were never statistically significant. Variations modeling term structure improved slightly, or in many cases worsened, with the omission of the two inflation variables. In Table 57 only the two most significant variables were left in the model. This had slight to detrimental effects on their explanatory power of explaining returns.

Risk is dynamic with companies continually changing their holdings and the average CEO tenure being just three years. Therefore the use of the short four-year window, instead of a 30-year time span, is of more relevance for institutional investors and the typical practitioners that want to know how the market prices with the macroeconomic factors. The overall lack of strong support for the factors is an indication that macroeconomic forces are not significant in explaining market returns for the Asian markets during the 2012 to 2016 period. The five popular macroeconomic factors are therefore abandoned as inferior for the remainder of the analysis. Three macroeconomic factors found in previous research to explain returns in ASEAN (Thailand specifically) will be used in a forecast model for comparison with the behavioral sentiment factors. Those three factors are the Dow Jones, the Nikkei, and the nation's minimum loan rate. In addition, the sentiment factors will be explored in greater detail.

Based on the low correlations and insignificant regressions, at the monthly frequency, the macroeconomic factors are not as promising as the sentiment factors for predicting returns. The previously mentioned APT studies (Chen, Roll, and Ross (1986) and Fama (1990)) had been disparaged due to the fact that regression models do not prove predicting powers. The best way to test a factor is not with an in-sample regression model fit, but to estimate a model in-sample to then perform a rolling out-

of-sample forecast to test accuracy with the withheld data. Other studies attempting to forecast exchanges in ASEAN have tested: Nasdaq; Dow Jones; S&P 500; Nikkei; Hang Seng; Straits Times; Industrial Index; gold prices; oil prices; local minimum loan rate; and exchange rates of the USD, JPY, HKD, and SKD with the local currency. However, the studies only found the Dow Jones (DJ), Nikkei (NK), and the local minimum loan rate (MLR) to be significant variables. For example, in explaining the Stock Exchange of Thailand (SET), Sutheebanjard and Premchaiswadi (2010) found the DJ, NK, and MLR to be significant and Sopipan, Sattayatham, and Chongcharoen (2013) found the DJ and NK to be significant. Therefore, due to the low data frequency available for many of the macroeconomic factors only the DJ and NK are further analyzed along with the sentiment factors at the higher daily frequency.

This study found the daily correlations of the variables with the SET were 0.2493 (DJ), 0.4009 (NK), and -0.0495 (MLR). Whereas, the correlation of the retail investor sentiment factor used in this study is a mighty -0.6346 with the SET. The two variables, used in other studies that were found to be the most correlated, at the daily frequency, (DJ and NK) were then individually tested in a logit regression, in this study, to compare with the retail sentiment model. The AICs were 3225 (DJ) and 2995 (NK), and the McFadden R^2s were 0.0136 (DJ) and 0.0375 (NK). Whereas the retail sentiment model outperformed all of the previous literature's variables for forecasting in Thailand with a lower AIC of 1769 and a higher McFadden R^2 of 0.1794. In Malaysia, the daily economic correlations with the Bursa Malaysia were 0.1432 (DJ) and 0.3838 (NK). However, the sentiment factors were a much higher -0.4091 (Retail) and 0.4436 (Foreign) (see Table 4(B)). The logit regression AICs

were 2162 (DJ) and 1987 (NK), and the McFadden R^2s were a dismal 0.0021 (DJ) and 0.0647 (NK). The sentiment model in Malaysia had an AIC of 2103 and a higher McFadden R^2 of 0.0929 (see table 12 for sentiment results).

This study had implemented both the principal component and factor analysis techniques. However, it was found that the factor correlations with returns and the significance of the regressions were inferior to those of the principal components. Within the sample used, principal component analysis is therefore found to support APT better than factor analysis. This is in agreement with a study by Connor and Korajczyk (1986) in which they found PCA results to be a significant improvement over factor analysis results. Thus, the factor analysis results have been omitted. Principal component analysis (PCA) has been found to be analogous to factor analysis for arbitrage pricing studies but simpler to interpret the results. It is an easier technique in that it relies on variances, whereas factor analysis is covariance motivated. PCA extracts a set of components from the data that best explains the variance in the data set though both approaches rely on the assumption of multivariate normality. Additional disadvantages of factor analysis are that there is no meaning of the signs produced, the scaling of the estimates is arbitrary, and the factors' order may be produced differently from sample to sample (Elton and Gruber (1994)).

Behavioral Factors

"In general, the contrarian behavior of individual investors on the NYSE seems important for understanding short-horizon return predictability."

-Kaniel, Saar, and Titman (2008)

In Thailand, the conditional probabilities revealed information about the trading behaviors. When the market went up, foreigners (retail) were net buyers (sellers) 61 (72) percent of the time. If the market went up two consecutive days, the foreigners (retail) buy (sell) 73 (85) percent of the time. If the market went up three days in a row, the foreigners (retail) buy (sell) 78 (87) percent of the time. If the market went down, foreigners (retail) were net sellers (buyers) 66 (75) percent of the time. If the market went down two consecutive days, the foreigners (retail) sell (buy) 79 (90) percent of the time. If the market went down three days in a row, the foreigners (retail) sell (buy) 82 (95) of the time. Therefore, as the market trends up or downwards, each group strengthens in their feedback trading style. Furthermore, if the foreign (retail) group was practicing their positive (negative) feedback strategy the prior day, during a 2 to 3-day trending market, then they were 10 (4) percent more likely to continue with their feedback behavior. For example, if the market went up three consecutive days, as previously stated, the foreigners were net buyers 78 percent of the time. However, if they were also net buyers on the second consecutive day, then they would be net buyers on the third day 88 percent of the time.

Whenever the market moves in the same direction for at least two consecutive days, the local individual investor accounts are taking a loss, whereas foreigners receive a gain. In the past ten years, the SET has repeated yesterday's direction (up or down) 52.21 percent of the time, giving a slight edge to foreign investors. This trading supports Boonvorachote and Panyawattananon's (2012) study in which they found from 2006-2010 that the foreigners tended to outperform the local group.

There is a strong positive contemporaneous correlation with stock returns, institutional, proprietary, and foreign trading (see Table 4). Short-term positive

feedback trading by institutions has been linked to long-run instability in the market. At time $_{t+0}$ these three investor groups exhibit herding between each other and positive feedback trading patterns. The summary statistics (Table 1 and Table 2) illustrate the group with the most extreme herding in buying and selling to be institutions which, along with the other evidence, concur with Lakonishok, Shleifer, and Vishny's (1994) finding that institutional herding is a symptom of agency problems. The retail group, which had the strongest impact on market returns, plays by a negative feedback strategy resulting in a negative contemporaneous correlation with returns and net flows. The smallest correlation with change in returns are the foreign net purchases, making their behavior less volatile to market changes, indicating they follow the prudent man rule. The imbalances reveal the foreigners to have had the least amount of day to day herding. Both the correlation and imbalance results provide evidence that foreigners are the least speculative group. This result concurs with the findings of Cai and Zheng (2003). There have been numerous studies regarding herding on individual stocks, but few examined if herding persists at the market-wide level. The above-mentioned herding findings thus fill a gap on aggregate herding and are another contribution of this study. In addition, buy and sell herding was more prevalent during the bear than bull market for all investor types in both countries. During both bear and bull markets the investor groups exhibit asymmetric herding. All of the groups tend to have higher levels of pessimistic herding (sell-offs), but institutions were found to exhibit a tendency of higher levels of optimistic herding (during buy-ups).

Table 4 Contemporaneous Correlation 3/24/2011-3/23/2016

Thailand

	SET	Retail	Foreign	Institution	Proprietary
SET	1	-0.6321	0.2949	0.3985	0.4139
Retail	-0.6321	1	-0.7317	-0.4603	-0.3239
Foreign	0.2949	-0.7317	1	-0.1639	0.0186
Institution	0.3985	-0.4603	-0.1639	1	-0.0594
Proprietary	0.4139	-0.3239	0.0186	-0.0594	1

Malaysia

	Bursa	Retail	Foreign	Institution
Bursa	1	-0.4091	0.4436	-0.3617
Retail	-0.4091	1	-0.5553	0.2627
Foreign	0.4436	-0.5553	1	-0.9379
Institution	-0.3617	0.2627	-0.9379	1

Note: Sentiment measures and market returns should be correlated as sentiment incorporates market expectations. The strong negative correlation between retail and foreign, in Thailand, concurs with the results of Table 1 and Table 2.

4.1 Vector Autoregression (VAR)

As mentioned in the methodology, the unrestricted VAR(1) in levels was used and a restricted VAR(1) was also modeled to see if it could improve model fit. The table of the restricted VAR coefficients is in Table 5. Interestingly the only investor group retained in the SET equation was the Retail. All statistically insignificant coefficients were restricted from the calculations, with the t-value threshold set at two. This indicates the most significant investor group to influence the SET is retail. The institution equation is negatively dependent on the behavior of the proprietary group, but proprietary is not significantly dependent on institution group purchases.

Therefore the smallest group, proprietary, may have better market timing than institutions.

Table 5 Restricted VAR(1) Net cash flow

Lag 1 Coefficient:

Equation:	SET	Retail	Foreign	Institution	Proprietary
SET	0.0000	-0.0003	0.0000	0.0000	0.0000
Retail	-37.3002	0.0000	-0.2325	-0.1415	-0.2812
Foreign	25.6922	0.0000	0.3951	0.0000	0.2436
Institution	11.5893	-0.1288	-0.3245	0.0000	-0.1739
Proprietary	0.0000	-0.0345	0.0000	0.0000	0.0000

The unrestricted vector autoregressions on the first five-year sub-sample period (2006-2011) show that the investment behaviors of the groups are intertwined. All the investor group net purchases are dependent on the SET returns, as it is significant in all equations. Additionally, all of the endogenous variables of the institution equation are significant. In the more recent period (2011-2016) only local individuals are significant in explaining the SET returns, all endogenous variables except foreign are significant in the institution equation, and all groups are significant in explaining the behavior of the foreigners. This is suggestive of the foreign group weakening in market power and increasing in sensitivity from one five-year period to the next. The only variable that significantly impacts on every investor group equation is the SET. This supports that the SET directs the behavior of investors and no investor group controls the market. The magnitude of the market coefficients for all the investor groups diminishes considerably from lag $_{t-1}$ to $_{t-2}$. The coefficient signs are also reversed for the market returns from lag $_{t-1}$ to $_{t-2}$ on all investor equations. The sub-sample regression tables were withheld for brevity.

For the full sample, the VAR model showed that past demand from only retail investors significantly affected market returns (see Table 6 for the equation estimates). Finally, the inclusion of four lags in the VAR models did not yield any significance on market returns for any investor lags greater than one. This indicates that past investor demand, prior to $_{t-1}$, does not significantly affect returns on the market. The foreign group was the least significant group in the SET returns regression. The fact that foreign investors do not impact the SET coincides with a study by Chayawadee (2003) in which foreigners were found not to have caused any negative impact to the Thai market during the 1997 Asian Financial Crisis. Chayawadee actually concludes if anything the foreigners had helped the Thai stock market as they were net buyers during the fall of the exchange. Another observation from the VAR model, as was found with the restricted model, was that the institution's net purchases are negatively and significantly dependent on the proprietary group, but the institutions do not influence the proprietary. Again this is indicative that proprietary traders have better timing and/or dictate the actions of institutions, suggestive of possible agency problems.

Finally, the inclusion of four lags in the VAR models did not yield any significance on market returns for any investor lags greater than one. This indicates that past investor demand, prior to $_{t-1}$, does not significantly affect returns on the market.

Table 6 Unrestricted VAR(1) Imbalance

	Estimate	**Std. Error**	**t-value**	**p-value**
VAR Equation: SET				
SET	-2.470e-03	3.839e-02	-0.064	0.9487
Retail	-1.681e-02	7.167e-03	-2.345	0.0192

Foreign	-4.088e-03	9.470e-03	-0.432	0.6660
Institution	-1.109e-03	1.892e-03	-0.586	0.5578
Proprietary	-1.843e-03	1.583e-03	-1.164	0.2447
trend	2.364e-07	4.405e-07	0.537	0.5917
VAR Equation: Retail				
SET	-1.017e+00	2.055e-01	-4.948	8.56e-07
Retail	2.602e-01	3.836e-02	6.783	1.83e-11
Foreign	-3.119e-02	5.069e-02	-0.615	0.538
Institution	1.479e-02	1.013e-02	1.460	0.145
Proprietary	-4.841e-03	8.476e-03	-0.571	0.568
trend	2.233e-06	2.358e-06	0.947	0.344
VAR Equation: Foreign				
SET	3.562e-01	1.302e-01	2.735	0.006325
Retail	-1.146e-01	2.431e-02	-4.711	2.74e-06
Foreign	1.222e-01	3.213e-02	3.802	0.000150
Institution	-2.287e-02	6.420e-03	-3.562	0.000382
Proprietary	-3.542e-03	5.372e-03	-0.659	0.509726
trend	-2.545e-06	1.495e-06	-1.703	0.088824
VAR Equation: Institution				
SET	1.209e+00	6.473e-01	1.868	0.06203
Retail	9.268e-01	1.208e-01	7.669	3.52e-14
Foreign	5.897e-02	1.597e-01	0.369	0.71194
Institution	4.087e-01	3.191e-02	12.810	< 2e-16
Proprietary	8.163e-02	2.670e-02	3.058	0.00228
trend	2.076e-05	7.428e-06	2.795	0.00528
VAR Equation: Proprietary				
SET	-8.909e-01	7.576e-01	-1.176	0.2398
Retail	-1.790e-01	1.414e-01	-1.266	0.2058
Foreign	3.687e-01	1.869e-01	1.973	0.0487
Institution	-7.036e-03	3.734e-02	-0.188	0.8506
Proprietary	1.312e-01	3.125e-02	4.200	2.87e-05
trend	-1.777e-05	8.693e-06	-2.044	0.0412

4.2 Causality

Despite the use of high-frequency daily data in this study, which is prone to higher levels of noise, the tests strongly support Granger causality. The SET index clearly Granger causes all of the groups individually (pairwise tests) and collectively (multivariate test). There is also instantaneous Granger causality between the SET and the investor groups. The investor group that statistically Granger causes the SET with the most significance is retail at the five percent level. The foreign was the only other group to Granger cause the SET, though weakly at the 10 percent significance level. The other groups do not Granger cause the SET individually (pairwise tests). Though collectively (multivariate) the foreign, institution, and proprietary groups do Granger cause the SET with their herding behavior which is buying when retail is selling and vice versa. This could explain why when retail is selling (buying) the market moves up (down) as the other three groups are counteracting the effects. Over the entire ten year sample, retail and foreign were making opposite bets (one was the buyer while the other the seller) 79.93 percent of the time (Table 7). This could explain the reason why foreign at some lags was found to Granger cause the SET, as is explained by the fact that for every seller there needs to be a buyer.

In Malaysia, the institutional group is the largest; however, it and the other two groups **(**retail and foreign**)** were found to not granger-cause the Bursa exchange**.** Only the local retail was sensitive to returns and the groups exhibit much more independence than the groups on the Thai exchange.

The data was all stationary, but cointegration testing was performed solely as a cross-validation of the causality results as was discussed in the methodology. The

Engle-Granger (EG) procedure was used by pair-wising the variables. All of the residuals from the OLS regressions were found to be stationary and thus cointegrated. The Johansen procedure for a multivariate cointegration test was also performed and results were conclusive with the pairwise EG, the variables exhibit a long-run relationship. The trace and eigenvalue test statistics from the Johansen test indicated there were four cointegrated equations. The investor groups were strongly cointegrated at the one percent significance level.

Table 7 Percent of Time Direction (+ or -) of Net Change is the same at t+0

Thailand (A)

	Set	Foreign	Institution	Proprietary
Retail	0.2637	0.2007	0.3771	0.3886
Foreign	0.6290			
Institution	0.6368	0.4484		
Proprietary	0.6479	0.5051	0.5096	

Malaysia (B)

	Bursa	Foreign	Institution
Retail	0.3531	0.3514	0.5473
Foreign	0.6463		
Institution	0.3921	0.1188	

Note: In Thailand foreign, institution, and proprietary each move together with the SET over 60 percent of the time. Retail moves with the other groups the fewest amount of times, making them on the opposite side of the transactions with the other groups. Retail moves in the opposite direction of the SET 73.63 percent of the time.

Table 8 Granger Causality Relationships (Order 1)
Thailand

Independent:	**Granger Causality**	**Non-Granger Causality**
Set	Foreign 2.12 (0.05995) Retail 5.1722 (0.02312)	Proprietary 1.4258 (0.2327) Institution 0.1482 (0.7004)
Retail	Proprietary 7.3897 (0.006653) Set 26.556 (2.983e-07)	Institution 1.0191 (0.3129) Foreign 0.0891 (0.7654)
Foreign	Institution 5.3166 (0.02129) Retail 29.681 (6.157e-08) Proprietary 44.905 (3.153e-11) Set 60.455 (1.593e-14)	
Institution	Retail 53.098 (5.69e-13) Foreign 70.836 (2.2e-16)	Set 0.5816 (0.4459) Proprietary 0.3936 (0.5305)
Proprietary	Retail 3.9274 (0.04773)	Set 0.8352 (0.3609) Institution 1.1205 (0.29) Foreign 3.8434 (0.05017)

Malaysia

Independent:	**Granger Causality**	**Non-Granger Causality**
Bursa		Institution 1.3484 (0.2457) Foreign 0.5836 (0.445) Retail 2.293 (0.1301)
Retail	Institution 3.6083 (0.05765) Bursa 7.8247 (0.0052)	Foreign 0.0891 (0.0264)
Foreign		Institution 0.6195 (0.4314) Bursa 0.5958 (0.4403) Retail 0 (0.9946)
Institution	Retail 4.937(0.0264) Foreign 6.7367 (0.0095)	Bursa 0.962 (0.3268)

Note: In both countries, the pairwise tests were conclusive with the multivariate method. For Thailand, the retail group was found to Granger cause the SET at the five percent significance level. The foreign and retail group are buying and selling to each other 80 percent of the time over the 10 year sample period. This, in of itself, could be why the foreign group was found to weakly Granger cause the SET. The foreign investor group had the most significant Granger

causality from the SET. In other words, the SET Granger causes foreign investors' trading behavior more than any other group. This would suggest that the foreign group is reacting to the market, opposed to creating the market. Out to order (4), the Granger causality results remain consistent.

4.3 Impulse Response Function (IRF)

For the impulse response analysis, the direction and shape of the shocks were the same from one five-year period to the next. The recessionary period impulse response coefficients (shocks) are all less persistent and slightly smaller in magnitude than during the expansionary period. This difference between the bear and bull markets is conclusive with the findings of Beaudry and Koop (1993) and Potter (1995). The graphs of the simulated shock time paths are in Figure 2. Higher order VAR models were also estimated and the results were essentially the same as the information criterion favored first-order structural VAR.

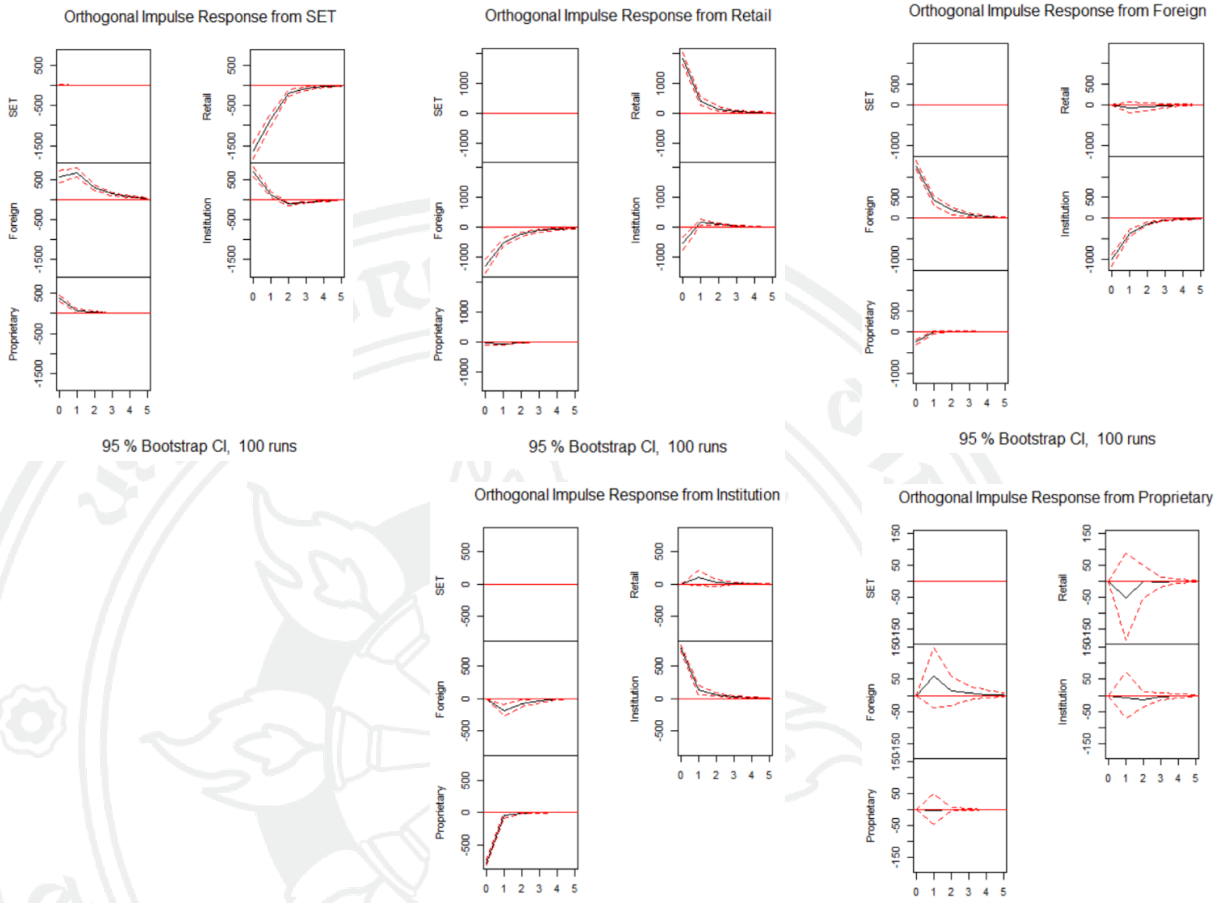
A positive shock of one standard deviation to the SET index would cause all of the investor groups to be net buyers at time zero to one, except retail. The only group that is able to move the SET is retail; the impulse coefficients for each equation can be found in Table 9. Though the three groups-- foreign, institution, and proprietary buy momentum when the market rises, the institutions begin the sell-off of the gains and mimic the retailers at $_{t+2}$. The reversal by institutions may be to correct over-reaction and/or short-term profit taking behavior. When retail is given a positive shock, institutions mimic the behavior of foreign and proprietary at time $_{t+0}$ by selling, but by $_{t+1}$ they switch strategy again to follow the large retail group. Likewise when the institution begins buying, the retail group is also buying. This could be because

local individuals are investing more money into their private accounts and with their agents within a day of each other.

When foreign investors make a move and begin large net buying, all three other groups become net sellers, with institutions being the group that sells the most to foreigners. When the institution or the proprietary group begin net buying, the other group begins net selling. As can be seen from the response in the institutions' graph in Figure 2A, the group that institutions buy the most from is the proprietary. The proprietary also begins large sell-offs the following day after large flows to buy. This could be characterized as pump-n-dump price manipulation or merely correcting for over-reaction. Furthermore, the trading between the two groups is indicative of a strong agency problem in which the dealers are making the opposite bet on their own accounts as they are for the accounts they manage for individuals. Policy, detailed in the conclusion, should be implemented to watchdog the dealers to make sure they are not able to pump up a price of a stock using institutional buying so that they can then sell their own holdings. If the fund managers are handling their clients' accounts in the clients' best interests, it would stand to reason they would not be negatively correlated as they are now.

In Malaysia, the groups have less impact on each other. When the Bursa exchange receives a positive shock, the foreign group is the only group to buy (positive feedback) and the other groups are selling (negative feedback). When the local retail group initiates heavy buying the foreign group helps to facilitate the transactions by selling to the retail investors, thus enabling market liquidity.

Thailand (A)



Malaysia (B)

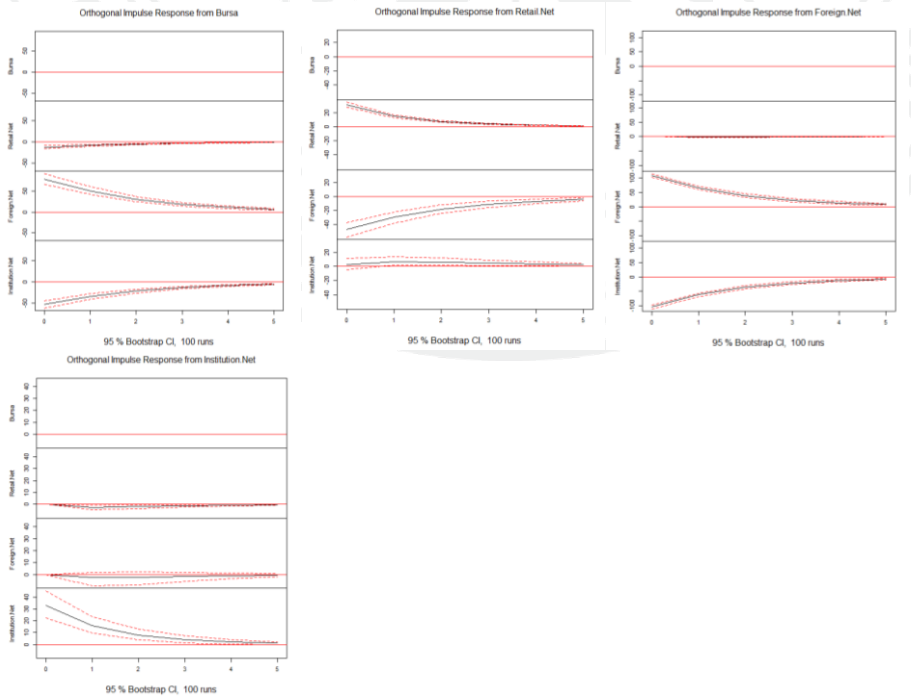


Figure 2 Impulse Response Graphs

Note: When the response is from the SET, the local investors are the only group that responds by selling. When the institution group is given a simulated positive shock, most of their buying is coming from the dealer group which is selling off. This is a sign of agency problems.

Table 9 Impulse Response Coefficients

Impulse Response from: SET

	SET	Retail	Foreign	Institution	Proprietary
$t_{+}0$	0.011	-1621.063	575.325	671.934	373.804
$t_{+}1$	0.000	-847.076	673.625	127.539	45.913
$t_{+}2$	0.000	-204.524	286.861	-115.227	32.890
$t_{+}3$	0.000	-71.029	130.539	-68.795	9.285

Impulse Response from: Retail

	SET	Retail	Foreign	Institution	Proprietary
$t_{+}0$	0.000	1842.927	-1267.798	-524.891	-50.237
$t_{+}1$	-0.001	384.620	-504.795	190.169	-69.994
$t_{+}2$	0.000	135.285	-236.123	118.500	-17.662
$t_{+}3$	0.000	48.220	-102.445	60.386	-6.162

Impulse Response from: Foreign

	SET	Retail	Foreign	Institution	Proprietary
$t_{+}0$	0.000	0.000	1270.222	-1012.694	-257.529
$t_{+}1$	0.000	-66.346	443.918	-364.390	-13.182
$t_{+}2$	0.000	-59.146	185.437	-128.204	1.913
$t_{+}3$	0.000	-28.267	77.306	-51.543	2.504

Impulse Response from: Institution

	SET	Retail	Foreign	Institution	Proprietary
$t_{+}0$	0.000	0.000	0.000	781.752	-50.237
$t_{+}1$	0.000	111.260	-195.310	137.949	-69.994
$t_{+}2$	0.000	24.464	-78.092	62.765	-17.662
$t_{+}3$	0.000	13.401	-34.839	23.017	-6.162

Impulse Response from: Proprietary

	SET	Retail	Foreign	Institution	Proprietary
$t_{+}0$	0.000	0.000	0.000	0.000	0.006
$t_{+}1$	0.000	-50.632	59.132	-7.321	-1.179

t_{+2}	0.000	-1.128	14.259	-15.679	2.548
t_{+3}	0.000	-2.964	7.279	-4.491	0.176

SET is in percent and investors are in millions of Baht.

Note: In the simulation, the retail group is the largest net change, in millions of baht, when the SET changes. When given a positive simulated change to the investors, only the retail group was able to move the SET. When the simulation shocked institutions into being net buyers, the dealers were selling off three times more than their average daily amount in baht. This could mean that the dealers are selling off their no longer desirable assets to their institutional accounts or a combination with the institutional accounts being used to pump up prices before the dealers dump their holdings. The proprietary group is the only group that when given a large impulse to be net buyers, switch the next day and sell-off.

4.4 Behavioral Forecasting

There has been a long-running debate in financial economics regarding the possible effect of sentiment on asset prices. Using actual forecasts, as opposed to the commonly used in-sample model fits, this study finds a link between investor sentiment and asset pricing. Runs test results had proven that, though none of the groups had mean reversion tendencies, they were all found to be not random at the 99 percent confidence level in both the subsamples and the full sample. Therefore, the group sentiments may be useful in forecasting the market. In a study regarding fund manager performance by Grinold and Kahn (1999), under the assumption that the market return was zero and just as likely to go up as down, they found that managers that were able to predict market movement 57.5 percent of the time were in the world-class quintile. Trading in Thailand based on investor group behavior can put an

investor in the arbitrage superstar class, with 75.54 percent accuracy over 2,441 degrees of freedom using the proposed logit regression model.

One may want to consider to model in, macroeconomic, consumer sales data to increase forecast accuracy of the retail group. This research found monthly retail store sales to be a significant variable that could be used to accurately predict if the retail investor was a net buyer or seller for the following month 68 percent of time. The two variables had a strong negative correlation of -0.30. The negative relationship between retail store sales and retail investor net purchases is typical of the marginal propensity theory in economics. This is due to the fact that as individuals consume more they save (invest) less and vice versa.

4.4.1 Vector Autoregression Model

The forecast error variance decomposition (FEVD) shows that the retail group plays the biggest role in predicting the SET index returns. Just as in the IRF, the foreign and proprietary groups have the least amount of impact on the SET, classifying them not as market makers, but rather opportunists. The behavior of the retail group has the biggest impact of forecast uncertainty to the foreign group; however, the reverse is not true. This coincides with the foreign group providing market liquidity for the retail.

The VAR model was used for a 90-day one step-ahead rolling forecast. The observations were withheld and a one day at a time prediction was made. The actual data now being available enters into the model for the next one day forecast (rolling). The magnitude of the predictions and the actual values are not noteworthy, as the forecast errors are quite high. However, the VAR model was able to correctly predict the direction of the SET index 57 percent of the time. This level of precision places a

trader in the world class category and contradicts the findings of the three papers in the literature review section. The result of the rolling forecast is in Table 10, but only include the last five of the 90 days for brevity, and the FEVD is in Table 11.

Table 10 Last Five of the 90-Day Rolling VAR Forecast (Exert)

Imbalance	Date	Retail	Foreign	Institution	Proprietary	SET
Actual	3/17/2016	0.0008	-0.0114	0.0097	0.0009	0.0017
	3/18/2016	-0.0312	0.037	-0.0038	-0.0021	0.002
	3/21/2016	-0.0107	-0.0009	0.0058	0.0058	0.0077
	3/22/2016	-0.022	0.0044	0.0169	0.0007	0.0026
	3/23/2016	-0.0102	0.0041	0.0015	0.0046	0.0107
Predicted	3/17/2016	0.0111	-0.012	0.001	-0.0001	-0.0009
	3/18/2016	0.0015	-0.0085	0.0068	0.0002	0.0001
	3/21/2016	-0.0087	0.0123	-0.0048	0.0012	0.0014
	3/22/2016	-0.0054	-0.0002	0.005	0.0006	0.0004
	3/23/2016	0.001	0.0053	-0.0024	-0.0038	0.0009

Net	Date	Retail	Foreign	Institution	Proprietary	SET
Actual	3/17/2016	74.24	-1085.04	926.67	84.13	0.0017
	3/18/2016	-3068.42	3644.96	-371.29	-205.25	0.002
	3/21/2016	-1129.01	-99.01	613.01	615.01	0.0077
	3/22/2016	-2756.85	551.82	2117.38	87.64	0.0026
	3/23/2016	-1076.18	435.75	154.89	485.54	0.0107
Predicted	3/17/2016	941.5836	-1143.252	224.2213	-22.553	-0.0012
	3/18/2016	106.6046	-723.1512	581.8373	34.7095	0.0001
	3/21/2016	-728.298	1102.095	-507.6897	138.8928	0.0015
	3/22/2016	-518.1556	4.9241	417.8085	95.4229	0.0004
	3/23/2016	-411.4707	-157.8482	435.0452	134.2742	0.0013

Note: The table provides the last five of the total 90 days predicted to compare with the actual values. Using a one day rolling forecast, the VAR was able to predict the direction of the SET 57 percent of the time. The investor group that the VAR was able to predict the direction of trading the best was the retail group. Given that 74 percent of the time over the 10-year

sample, the retail group moved in the opposite direction of the SET, this could be a very powerful predictor to model alone with the SET for future forecasting studies.

Table 11 Forecast Error Variance Decomposition (FEVD) Two Steps Ahead

	SET	Retail	Foreign	Institution	Proprietary
For SET					
$t+1$	1.0000	-	-	-	-
$t+2$	0.9957	0.0027	0.0007	0.0006	0.0003
For Retail					
$t+1$	0.4362	0.5638	-	-	-
$t+2$	0.4842	0.5130	0.0006	0.0018	0.0004
For Foreign					
$t+1$	0.0932	0.4525	0.4543	-	-
$t+2$	0.1744	0.4139	0.4024	0.0085	0.0008
For Institution					
$t+1$	0.1910	0.1166	0.4339	0.2586	-
$t+2$	0.1822	0.1214	0.4511	0.2454	0.0000
For Proprietary					
$t+1$	0.1705	0.0031	0.0809	0.7456	0.0000
$t+2$	0.1709	0.0089	0.0801	0.7400	0.0000

Note: The investor group that contributes the most to the forecast uncertainty of the SET is the retail investor group. This is another signal that the retail group is the most important predictor of the SET.

4.4.2 Logit Model

In Malaysia, the behaviors of the groups are fairly different. To reiterate in Thailand the local retail was a very large group that was the only contrarian and the rest were momentum. The foreign group had also been selling out of the Thai market. However, in summary, Malaysia's local retail is the smallest group

(in terms of amount value) and the only group selling out of the market. Both the local retail and local institutions are contrarian and foreign group is momentum. Both the foreign and institutional groups have been increasing market position. The foreign and institutional groups have been providing liquidity for one another with 88 percent of their daily trades over the entire sample period being in opposite directions with each other. The institutional group is the largest, but it along with the other groups were not found to granger-cause the Bursa exchange. The groups were found to be fairly independent on the exchange returns, with only local retail being sensitive to returns. The impulse response simulation confirms that the local retail and institutions have a tendency to trade in the same direction, while the foreign group trades in the reverse. The many differing characteristics between the Thai and Malaysian market will, therefore, make an interesting comparison in how well the sentiment factors forecast in both markets.

The staying power of the standard CAPM is, in part, its ease of use for practitioners. For a prediction model to be successful it should be accurate; but even more importantly, as the CAPM has shown, it should not be unnecessarily complicated. Because the VAR forecasting was able to determine the direction of the SET so well and for the aforementioned reasons, the logit regression model was employed.

The logit regression model allows the dependent variable to be binary. The dependent variable took a value of 0 for when the market fell and a value of 1 for

when the market rose. Using the full model of the four investor groups reveals what had already been found using the VAR, when the market moves up, all the investor groups are more likely to be net buyers, but the individual (retail) group is less likely to be a net buyer (Table 12). To be more specific the retail group would be 30 to 40 percent less likely to be net buyers (Table 13). Furthermore, all the investor groups were found to be statistically significant in the explanation of the direction of the market except the foreign group. It is for this reason in the second logit regression, in Table 12, the foreign group is removed from the model and the predictive accuracy of the model (75.54 percent) was unchanged, using the remaining three groups. The model was able to accurately guess the market would increase (decrease) when in fact it did 79.27 percent (71.05 percent) of the time. During the full sample, the market moved down 45.33 percent and up 54.67 percent of the time, which gives the conditional probability of the model being able to forecast tomorrow's market close using the end of today's information on the aggregate group behaviors with 75.54 percent accuracy.

With just the data from the individual traders, the logit model was able to predict the direction of the SET the following day with 74.19 percent accuracy over 2,441 degrees of freedom. The local investor group is a robust factor from bear to bull sub-sample periods. In the period from 3/24/2006 to 3/25/2011 (recessionary) the retail factor is able to achieve 73.68 percent out of sample forecast accuracy. Conversely, when out of sample testing for the period from 3/28/2011 to 3/23/2016 (expansionary), the sentiment (logit) model, with the sole use of the retail factor, is accurate 74.69 percent of the time. Not only was the retail sentiment model robust across time, but it was also applied to the Malaysian market from 10/1/2009 to

3/23/2016 and found to be accurate 66 percent of the time (Table 12). Using this model an investor would be able to outperform even the inside traders which, in aggregate, only predict accurately 60 percent of the time (Grinold and Kahn, 1999). If an investor long/shorts the market depending on the forecast at the open and sold their position at the close each day using the retail logit model they would outperform the market. Over the more recent 5-year period an investor would earn a daily average of 0.54 percent with a Sharpe ratio of 0.588, whereas if they bought and hold a market index they would only have received an average of 0.03 percent with a less desirable Sharpe ratio of 0.029. With an average additional daily gain of 0.51 (0.54 – 0.03) percent, regardless of the daily roundtrip (buy and sell) transaction costs of 0.2 for institutions and 0.3 for individuals, the sentiment model portfolio still outperforms by an average of 0.21 to 0.31 percent per day. A retail sentiment model trader would also have had a Merton-Henriksson gamma of 1.91, which indicates the excess return from superior market timing ability (see Table 14 for performance analytics). Welcome to the land of the supreme!

Table 12 Sentiment Model Forecast

Thailand (A)

	Logit			Probit	OLS
	(1)	(2)	(3)		
Retail	-1.7323**	-1.8513**	-2.1421**	-1.0437**	0.37249**
	10.883	15.018	18.280	11.160	13.091
Foreign	0.1873			0.1156	0.0312
	1.159			1.244	1.169
Institution	0.9242**	0.8722 **		0.5480**	0.1680**
	6.986	7.044		7.068	7.209
Proprietary	1.1460**	1.1220**		0.6754**	0.2107**
	9.156	9.108		9.235	9.588
AIC	1647.7	1647.0	1769.8	1647.8	
McFadden R^2	0.2389	0.2383	0.1794	0.2388	0.2967
Forecast Accuracy	75.54%	75.54%	74.19%		

Malaysia (B)

	Logit		Probit	OLS
	(1)	(2)		
Retail	-0.9274**	-1.1803**	-0.5722**	-0.2155**
	8.689	11.59	8.711	9.036
Foreign	0.9829**		0.6053**	0.2273**
	9.546		9.571	9.924
AIC	2103.6	2363.9	2103.6	
McFadden R^2	0.0929	0.0560	0.0929	0.1231
Forecast Accuracy	65.95%	64.68%		

Note: Test statistic value under coefficient. (**) 99 percent confidence level; (*) 95 percent confidence level. The magnitude of the coefficients cannot be interpreted, but the signs indicate if a group is less likely (-) or more likely (+) to be net buyers when the market increases. The McFadden Pseudo R^2 and AIC are used as the goodness of fit measures on the logit and probit models. For OLS the adjusted R^2 has been used instead. In both markets foreign (retail) trading

was positively (negatively) associated with market returns, implying an informational advantage (disadvantage) for this investor group.

Table 13 Average Marginal Effects

Thailand Scalars

	Logit			Probit	Logit
	(1)	(2)	(3)		Malay
Retail	-0.3003	-0.3213	-0.4054	-0.3085	-0.1387
Foreign	0.0325			0.0342	
Institution	0.1602	0.1514		0.162	
Proprietary	0.1987	0.1947		0.1996	

Note: If the market increased, individual investors were 30.03 percent less likely to be net buyers.

Table 14 Retail Sentiment Model Performance Analytics

Retail Sentiment Model Performance Analytics (3/28/2011 - 3/23/2016)

	Summary					Sharpe Ratio		
Portfolio Type	Min	Median	Mean	Max	σ	σ	VaR	ES
Buy & Hold	-0.0565	0.0006	0.0003	0.0592	0.0107	0.0289	0.0180	0.0108
Sentiment Model	-0.0287	0.0043	0.0054	0.0592	0.0092	0.5880	0.9529	0.8025

Market Timing of Retail Sentiment Model

	α	β	γ
Merton-Henriksson	-0.0019	-1.0343	1.9125
Treynor-Mazuy	0.0027	-0.0644	23.9621

Note: The Sharpe Ratio uses the standard deviation and two modified denominators for the risk measure, the Fisher VaR and the Conditional VaR (also known as Expected Shortfall).

CHAPTER 5

CONCLUSION AND IMPLICATIONS

Macroeconomic Factors

The stock exchange represents the pulse (leading indicator) for economic growth within each of the nations. Macroeconomic factors that are able to price the market empirically are thus able to influence the economy. This study finds support for the significance that risk premiums had for Malaysian stock returns. For development in the selected Asian countries, governments may, therefore, want to focus efforts on policy in open market trading of bonds (risk premium price control). Investors in Southeast Asia may do well to track this economic force. However, industrial production, term structure, and inflation were found not to be significant within the recent four-year sample over the two markets tested. The empirical results of the factor and principal component analysis also concur with Connor and Korajczyk's (1986) APT study that PCA is preferable over FA. However, the multivariate tests of APT find it to only be an effective asset pricing tool in Thailand whereas the tests of CAPM found it to be significant in all of the ASEAN markets (French (2017)). With practitioners relying on a few years of data, not decades, in asset pricing, the use of macroeconomic factors may be of little significance in explaining market returns. Sometimes the best things are the simplest things, which would explain the staying power of the CAPM.

When empirically testing the APT model, the factors to use are unspecified. This is both a strength and a weakness of the model, and finding factors with an economic basis behind market returns presents a continual difficulty. Previous APT studies (Chen et al. (1986); Fama (1990)) had been criticized as regression formulas do not indicate predictive powers of the variables. Future research may explore the forecasting abilities of risk premium, industrial production, and principal components. In addition, further tests of APT may explore the use of modeling in CAPM betas, firm characteristics and/or a set of industry portfolios, which may enable better equilibrium models in the capital markets. Studies could test the variables on industrial goods, financial institutions, and other industry portfolio returns. The fact the multivariate component, risk premiums, and industrial production were found to be significant does not necessarily validate APT, but instead, could mean that the wrong proxy for each country's market might have been used. It is still possible that the components and macroeconomic variables have been found to explain the market returns and that the CAPM theory is also significant.

Behavioral Factors

Behavioral finance studies seek out what mistakes to avoid and what strategies will generate superior performance. Overseas investing and international diversification has had great appeal, however, it no longer guarantees increased portfolio performance. Choosing the right country to invest in is a difficult decision. Being aware of behavioral biases and market inefficiencies may improve forecasting as demonstrated in this paper. In the literature review there existed contradictory findings for the three questions posed in this study. The findings in this paper aid to close this gap by presenting an empirical reconciliation.

Research Question 1: Are there distinct trading behaviors?

In this study, the dynamic relations between the aggregate trading of four investor groups and equity returns were empirically explored. The behavioral factors were highly significant in both ASEAN markets, giving support for the behavior theory over the risk theory as to why anomalies exist in asset pricing literature. The behaviors of the groups (1) were supported by all the tests. When local investors sell in response to some information (upward market movements initiate sells), other local individuals may observe these trades and perceive this as bad news about these stocks and follow suit. Foreign, institution, and proprietary investor holdings move in the same direction as contemporaneous market returns. Foreigners, institutions, and dealers (retail) follow a positive (negative) feedback strategy that strengthens as the market trends in the short-run. The short-term positive feedback behavior specifically by institutions was linked in past studies to market instability in the long-run.

Institutions, although not found to be significant in explaining the entire market, did exhibit extreme herding in both buy-ups and sell-offs. In previous literature, institutional herding had been linked to agency problems and may be indicative of price manipulation behavior. The proprietary was not a large enough group to impact the market but was found to have better market timing and be a significant determinant in the trading of the institutions. From all the tests, the group that causes the biggest impact on the behavior of the institutions is the proprietary with the proprietary investors making opposite bets with the money they manage (institutions'). The strong negative correlation between the institutions and proprietary groups, institutional herding, and proprietary being the dominate seller to institutions are all indicative of agency problems.

There are many past recommendations to reduce agency problems. Ambachtsheer, Capelle, and Lum (2008) and Dewenter, Han, and Malatesta (2009) found that portfolios perform better as the board independence increases. The US SEC believed mutual fund trustees overbought stocks of companies they served as agents for in 401(k) plans, which contributed to market timing scandals between the asset accounts of the firms and those they managed for their beneficiaries. This prompted the SEC to make new rules that 75 percent of the fund boards must be independent and so must the chair. Ambachtsheer (2011) has designed metrics linking agent pay to long-term fund performance to reduce the plundering and mismanagement of institutional accounts.

Research Question 2: Do any investors impact each other or the market?

This study presents market-level herding instead of the commonly performed stock-level herding which does not account for the fact that investors may move in and out of the market in unison. Additionally, another contribution of this study is that retail investors buying and selling in unison had significant impact on asset prices. In further examining if any groups impact each other and/or the SET (2), the “causality” tests reveal a clear statistical link between past returns and daily trading; however, the only group that impacted the SET at the 95 percent confidence level was retail. This is also supported by the contemporaneous correlation, restricted VAR, IRF, and FEVD results, making the most powerful group the local investors trading on their individual accounts.

The foreigners, per all tests, were found to be the least significant group in the day to day market returns in Thailand and have been getting weaker every year. From the period 2011 to 2016 the foreigners have decreased their position in the SET by

over 289 billion baht (~9 billion USD). In the case of foreigners, large herding would have been a “hot money” indicator. However, the foreigners were actually found to of have had the smallest amount of herding, provide liquidity for the local investors, and exhibit prudent man trading.

This is interesting because, in the Thai financial news, the feared foreigners are reportedly the main determinant of what moves the market and locals are encouraged with a sense of duty to buy into the market. The foreigner is believed to be a more newsworthy predictor variable than macroeconomic variables such as prices of oil, unemployment, inflation, and interest rates. This research leaves it for future studies to explore whether an investor knew how negative investment news regarding foreigners motivated locals to patriotically buy into the market and if they, in turn, knew how that net purchasing affected the market. Then does whoever control the news about foreigners have a primitive forecast method for the market following the news event? In other words, do dealers use press about foreign traders to control the retail traders and thus know the market? With the model proposed the tactic is no longer needed as they can know the market 76 percent of the time.

Research Question 3: Does sentiment predict returns?

One of the main contributions of this study was the development of a new sentiment forecasting model. Under the assumption of the semi-strong form of the efficient market hypothesis, past information cannot be used to earn excess returns. However, today’s sentiment may be used to predict tomorrow’s returns with great accuracy. With locals buying when the markets move down and selling when the markets move up on the same day (at $_{t+0}$), 73.63 percent of the time over ten years, it can then be profitable to forecast this group’s behavior (3). An investor could short

the market when the locals are suspected to be buying and buy into the market when locals are selling. Using a VAR forecast of all the investor groups, this study was able to predict the direction of the exchange at $_{t+1}$ 57 percent of the time over a 90-day one-day rolling forecast window. This can be very useful for large investors willing to trade daily. The VAR forecast alone is quite admirable, achieving world class predictability. However, more importantly using a logit regression this study was able to use investor group buying behavior to predict the direction of the exchange at $_{t+1}$ with an unprecedented 75.54 percent accuracy over 2,441 degrees of freedom. With the forecast accuracy of investor groups' net purchases, used to signify sentiment, on market returns being of supreme ability, this is of importance for future market sentiment and asset pricing studies and may encourage more large overseas investment. The additional foreign investment inflow could offset the current small daily average outflow.

A limitation of this study, in studying of the behaviors, is that each investor group may have a few mogul players that skew the results for the entire group. Future research may want to filter out the cash-rich savvy investors who have the power to alter the aggregate results for the rest of their sample group or use a trade-based imbalance measure in lieu of the volume-based used. Further studies could also try to use intra-day group account data for a more detailed analysis and/or distinguish between limit and market orders to examine if the retail investors are truly contrarian in behavior or if the apparent behavior simply stems from automatically executed trades (limit orders).

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APPENDIX

TABLE 15 TO 57

Table 15 Diagnostics

	Imbalance.var	Net.var
JB-Test multivariate	p-value < 2.2e-16	p-value < 2.2e-16
Skewness only multivariate	p-value < 2.2e-16	p-value < 2.2e-16
Kurtosis only multivariate	p-value < 2.2e-16	p-value < 2.2e-16
Portmanteau Test asymptotic	p-value = 0.02379	p-value = 0.0002404

Table 16 Multicollinearity Regression Model
model1=lm(SET.Change.2~Retail.Imbalance.2+Foreign.Imbalance.2+Institution.Imbalance.2+Proprietary.Imbalance.2)

kappa(model1)
[1] 26.27491

vif(model1)

Retail.Imbalance.2	Foreign.Imbalance.2	Institution.Imbalance.2	Proprietary.Imbalance.2
1.756834	1.380609	1.366364	1.118555

Table 17 Unrestricted VAR(1) Net Change

	Estimate	**Std. Error**	**t-value**	**p-value**
VAR Equation: SET				
SET	0.01	0.04	0.13	0.90
Retail	-0.04	0.05	-0.65	0.52
Foreign	-0.04	0.05	-0.65	0.52
Institution	-0.04	0.05	-0.65	0.52
Proprietary	-0.04	0.05	-0.65	0.52
trend	0.00	0.00	0.67	0.51
VAR Equation: Retail				
SET	-47000	9111	-5.16	0.00***
Retail	-9005	12480	-0.72	0.47
Foreign	-9005	12480	-0.72	0.47
Institution	-9005	12480	-0.72	0.47
Proprietary	-9005	12480	-0.72	0.47
trend	0.07	0.10	0.68	0.50
VAR Equation: Foreign				
SET	33670	6996	4.81	0.00***
Retail	10520	9580	1.10	0.27

Foreign	10520	9580	1.10	0.27
Institution	10520	9580	1.10	0.27
Proprietary	10520	9580	1.10	0.27
trend	-0.29	0.08	-3.76	0.00***
VAR Equation: Institution				
SET	16730	5707	2.93	0.00**
Retail	1302	7815	-0.17	0.87
Foreign	-1302	7815	-0.17	0.87
Institution	-1302	7815	-0.17	0.87
Proprietary	-1302	7815	-0.17	0.87
trend	0.19	0.06	2.97	0.00**
VAR Equation: Proprietary				
SET	-3398	3361	-1.01	0.31
Retail	-210	4602	-0.05	0.96
Foreign	-210	4602	-0.05	0.96
Institution	-210	4602	-0.05	0.96
Proprietary	-210	4602	-0.05	0.96
trend	0.03	0.04	0.93	0.35

Table 18 Vector Autoregression Results

lm(formula = SET.Change ~ Retail.Net + Foreign.Net + Institution.Net)

	Estimate	Std .Error	t value	Pr>|t|
)Intercept(	1.366e-04	2.157e-04	0.633	0.5266
Retail.Net	-5.371e-06	3.129e-07	-17.167	<2e-16 ***
Foreign.Net	-2.860e-06	3.296e-07	-8.678	<2e-16 ***
Institution.Net	-8.045e-07	3.446e-07	-2.335	0.0196 *

lm(formula = SET.Change ~ Retail.Imbalance + Foreign.Imbalance + Institution.Imbalance)

	Estimate	Std .Error	t value	Pr>|t|
)Intercept(	0.0004537	0.0002119	2.141	0.0324 *
Retail.Imbalance	-0.2698764	0.0174831	-17.167	< 2e-16 ***
Foreign.Imbalance	-0.1021613	0.0182051	-5.612	2.23e-08 ***
Institution.Imbalance	0.0367112	0.0193790	1.894	0.0583

Table 19 Estimation Results from 3/24/06 to 3/23/16 (Net)

SET.Change = SET.Change.l1 + Retail.Net.l1 + Foreign.Net.l1 + Institution.Net.l1 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.l1	-1.508e-02	2.564e-02	-0.588	0.556
Retail.Net.l1	2.107e-07	4.195e-07	0.502	0.615
Foreign.Net.l1	6.597e-07	4.239e-07	1.556	0.120
Institution.Net.l1	3.755e-07	4.368e-07	0.860	0.390
trend	2.777e-07	1.943e-07	1.429	0.153

Retail.Net = SET.Change.l1 + Retail.Net.l1 + Foreign.Net.l1 + Institution.Net.l1 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.l1	-2.889e+04	4.328e+03	-6.674	3.07e-11 ***
Retail.Net.l1	3.727e-01	7.081e-02	5.263	1.54e-07 ***
Foreign.Net.l1	1.135e-01	7.156e-02	1.586	0.11288
Institution.Net.l1	2.152e-01	7.374e-02	2.918	0.00355 **
trend	1.383e-02	3.281e-02	0.421	0.67350

Foreign.Net = SET.Change.l1 + Retail.Net.l1 + Foreign.Net.l1 + Institution.Net.l1 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.l1	2.864e+04	3.505e+03	8.170	4.91e-16 ***
Retail.Net.l1	-2.509e-01	5.735e-02	-4.375	1.27e-05 ***
Foreign.Net.l1	1.373e-01	5.795e-02	2.370	0.01789 *
Institution.Net.l1	-3.169e-01	5.971e-02	-5.307	1.21e-07 ***
trend	-8.113e-02	2.657e-02	-3.054	0.00229 **

Institution.Net = SET.Change.l1 + Retail.Net.l1 + Foreign.Net.l1 + Institution.Net.l1 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.l1	2445.69020	2403.39148	1.018	0.30897
Retail.Net.l1	-0.03066	0.03932	-0.780	0.43556
Foreign.Net.l1	-0.18591	0.03973	-4.679	3.04e-06 ***
Institution.Net.l1	0.16031	0.04094	3.916	9.27e-05 ***
trend	0.05563	0.01822	3.054	0.00228 **

Table 20 Covariance Matrix of Residuals from 3/24/06 to 3/23/16 *(*Net*)*

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
SET.Change	1.805e-04	-1.847e+01	8.939e+00	7.205e+00
Retail.Net	-1.847e+01	5.144e+06	-3.278e+06	-1.476e+06

Foreign.Net	8.939e+00	-3.278e+06	3.374e+06	-6.447e+04
Institution.Net	7.205e+00	-1.476e+06	-6.447e+04	1.586e+06

Table 21 Correlation Matrix of Residuals from 3/24/06 to 3/23/16 *(*Net*)*

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
SET.Change	1.0000	-0.6060	0.36225	0.42585
Retail.Net	-0.6060	1.0000	-0.78688	-0.51657
Foreign.Net	0.3622	-0.7869	1.00000	-0.02787
Institution.Net	0.4258	-0.5166	-0.02787	1.00000

Table 22 Impulse Response Coefficients from 3/24/06 to 3/23/16 *(*Net*)*

SET.Change

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
]1,[	1.343552e-02	-1374.4713952	665.4330809	536.2503031
]2,[	1.480493e-04	-709.4814760	651.0187032	37.2590730
]3,[	2.917212e-04	-186.7956417	259.8218301	-92.9414421
]4,[	9.273484e-05	-68.5565769	120.3495887	-56.7618477
]5,[	4.223135e-05	-26.7848573	54.3697293	-29.1447636

Retail.Net

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
]1,[	0.000000e+00	1804.2072543	-1310.0488373	-409.2569868
]2,[	-6.377194e-04	435.6797449	-502.8305652	122.6220781
]3,[	-1.842325e-04	150.1172447	-235.4732653	98.2201331
]4,[	-8.404064e-05	55.6806982	-106.3989635	54.4689586
]5,[	-3.673381e-05	22.8248062	-48.2481589	26.5996981

Foreign.Net

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
]1,[	0.000000e+00	0.0000000	1102.2185544	-868.7840743
]2,[	4.008604e-04	-61.8483512	426.6836039	-344.1878893
]3,[	1.331427e-04	-60.2667152	194.6648898	-131.6246116
]4,[	6.427988e-05	-32.5370533	87.3769547	-55.1173092
]5,[	2.911683e-05	-15.9267413	39.4694405	-23.9252193

Institution.Net

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
]1,[	0.000000e+00	0.00000000	0.0000000	613.37366157

]2,[	2.303474e-04	131.98437168	-194.3833016	98.33004834
]3,[	-6.696764e-05	41.63318051	-84.3695508	48.41748527
]4,[	-2.769155e-05	18.29416433	-39.2921843	22.00658612
]5,[	-1.338349e-05	7.89408472	-17.7523050	10.20401313

Lower Band, CI= 0.95

SET.Change

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
]1,[	1.257964e-02	-1620.0371001	499.3350672	473.7756920
]2,[	-4.330686e-04	-838.4614692	544.9164306	-19.1682896
]3,[	1.064349e-04	-242.4727541	205.0668577	-128.3133659
]4,[	1.711544e-05	-95.3792088	91.0145296	-80.4683901
]5,[	2.473877e-06	-40.8037730	37.5677040	-40.5888468

Retail.Net

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
]1,[	0.000000e+00	1.599719e+03	-1508.266058	-549.60143729
]2,[	-1.071901e-03	3.349836e+02	-596.406241	59.15403476
]3,[	-3.510328e-04	9.742240e+01	-295.611481	69.36513835
]4,[	-1.691563e-04	3.031200e+01	-142.272554	40.41704887
]5,[	-8.326663e-05	8.569427e+00	-71.041967	19.23694162

Foreign.Net

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
]1,[	0.000000e+00	0.0000000	1.030873e+03	-953.4137252
]2,[	-1.029298e-04	-125.1386171	3.509022e+02	-384.1973136
]3,[	-8.982436e-05	-113.3612192	1.385937e+02	-158.2231132
]4,[	-3.657456e-05	-61.9407265	5.181182e+01	-71.1024747
]5,[	-1.343806e-05	-32.4220670	1.915986e+01	-33.6213774

Institution.Net

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
] 1,[	0.000000e+00	0.000000e+00	0.0000000	574.75671587
] 2,[	-2.776192e-04	4.832641e+01	-259.4898916	66.67719455
] 3,[	-1.444518e-04	5.274347e+00	-118.6872694	31.14321618
] 4,[	-6.096503e-05	2.417427e+00	-58.8940890	11.95734174
] 5,[	-3.250223e-05	9.093580e-01	-28.1945337	4.69516070

Upper Band, CI= 0.95

SET.Change

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
] 1,[	1.456119e-02	-1.195110e+03	877.941801	593.81340414
] 2,[	6.466471e-04	-5.850384e+02	784.984370	109.22399824
] 3,[	4.951477e-04	-1.331691e+02	329.933082	-58.10440058
] 4,[	1.797979e-04	-4.263281e+01	158.872169	-40.05246885
] 5,[	9.382568e-05	-1.269606e+01	76.466634	-19.79717162

Retail.Net

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
] 1,[	0.000000e+00	1999.7811945	-1.081757e+03	-314.1568170
] 2,[	-1.510541e-04	519.7522769	-4.012788e+02	187.8200216
] 3,[	-3.279619e-05	194.4222001	-1.777608e+02	129.1513528
] 4,[	5.129314e-07	85.5919395	-7.781163e+01	72.5112274
] 5,[	5.333366e-06	40.2558768	-3.019594e+01	36.6844877

Foreign.Net

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
] 1,[	0.000000e+00	0.000000000	1177.890892	-781.89376999
] 2,[	8.776756e-04	15.177641417	489.399622	-294.97168439
] 3,[	2.967605e-04	3.359645054	247.734329	-102.37343109
] 4,[	1.440769e-04	2.912549448	124.017606	-40.49707999
] 5,[	7.027030e-05	1.456266244	61.846267	-16.29572527

Institution.Net

	SET.Change	Retail.Net	Foreign.Net	Institution.Net
] 1,[	0.000000e+00	0.0000000	0.00000000	653.7469820
] 2,[	6.627778e-04	205.3125724	-112.01029278	139.6974102
] 3,[	1.587215e-05	74.3415513	-42.44261910	66.5258161
] 4,[	6.284010e-06	31.4099234	-17.82700887	31.9507951
] 5,[	2.495633e-06	14.5884341	-6.44352186	15.6497653

Table 23 Estimation Results from 3/24/06 to 3/23/16 *(*Imbalance*)*

SET.Change = SET.Change.l1 + Retail.Imbalance.l1 + Foreign.Imbalance.l1 + Institution.Imbalance.l1 + SET.Change.l2 + Retail.Imbalance.l2 + Foreign.Imbalance.l2 + Institution.Imbalance.l2 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.l1	-7.422e-02	2.706e-02	-2.742	0.00614 **
Retail.Imbalance.l1	-1.200e-02	2.393e-02	-0.501	0.61618
Foreign.Imbalance.l1	4.479e-02	2.395e-02	1.871	0.06152 .
Institution.Imbalance.l1	3.892e-02	2.541e-02	1.532	0.12577
SET.Change.l2	9.744e-03	2.659e-02	0.366	0.71407
Retail.Imbalance.l2	1.554e-04	2.386e-02	0.007	0.99480
Foreign.Imbalance.l2	-2.909e-03	2.417e-02	-0.120	0.90421
Institution.Imbalance.l2	-2.019e-02	2.510e-02	-0.804	0.42133
trend	3.363e-07	1.937e-07	1.736	0.08268 .

Retail.Imbalance = SET.Change.l1 + Retail.Imbalance.l1 + Foreign.Imbalance.l1 + Institution.Imbalance.l1 + SET.Change.l2 + Retail.Imbalance.l2 + Foreign.Imbalance.l2 + Institution.Imbalance.l2 + trend

Table 24 Estimation Results from 3/24/06 to 3/23/16 (Imbalance)

	Estimate Std.	Error	t value	Pr>|t|
SET.Change.l1	-3.480e-01	7.025e-02	-4.953	7.79e-07 ***
Retail.Imbalance.l1	3.347e-01	6.212e-02	5.388	7.82e-08 ***
Foreign.Imbalance.l1	-2.914e-02	6.216e-02	-0.469	0.63925
Institution.Imbalance.l1	-2.951e-02	6.596e-02	-0.447	0.65469
SET.Change.l2	2.077e-01	6.902e-02	3.009	0.00265 **
Retail.Imbalance.l2	1.035e-01	6.193e-02	1.672	0.09473 .
Foreign.Imbalance.l2	-4.642e-02	6.273e-02	-0.740	0.45936
Institution.Imbalance.l2	6.193e-02	6.516e-02	0.950	0.34202
trend	3.923e-07	5.028e-07	0.780	0.43531

Foreign.Imbalance = SET.Change.l1 + Retail.Imbalance.l1 + Foreign.Imbalance.l1 + Institution.Imbalance.l1 + SET.Change.l2 + Retail.Imbalance.l2 + Foreign.Imbalance.l2 + Institution.Imbalance.l2 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.l1	4.364e-01	5.829e-02	7.486	9.90e-14 ***
Retail.Imbalance.l1	-1.179e-01	5.155e-02	-2.288	0.02224 *

Foreign.Imbalance.l1	3.100e-01	5.158e-02	6.011	2.13e-09 ***
Institution.Imbalance.l1	-7.240e-02	5.474e-02	-1.323	0.18609
SET.Change.l2	-6.334e-02	5.728e-02	-1.106	0.26888
Retail.Imbalance.l2	-4.892e-02	5.139e-02	-0.952	0.34126
Foreign.Imbalance.l2	1.456e-01	5.206e-02	2.797	0.00519 **
Institution.Imbalance.l2	-9.954e-02	5.407e-02	-1.841	0.06576 .
trend	-1.026e-06	4.172e-07	-2.460	0.01398 *

Institution.Imbalance = SET.Change.l1 + Retail.Imbalance.l1 + Foreign.Imbalance.l1 + Institution.Imbalance.l1 + SET.Change.l2 + Retail.Imbalance.l2 + Foreign.Imbalance.l2 + Institution.Imbalance.l2 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.l1	-6.752e-02	4.074e-02	-1.657	0.097588 .
Retail.Imbalance.l1	-1.498e-01	3.603e-02	-4.157	3.34e-05 ***
Foreign.Imbalance.l1	-2.230e-01	3.605e-02	-6.185	7.25e-10 ***
Institution.Imbalance.l1	1.443e-01	3.826e-02	3.771	0.000166 ***
SET.Change.l2	-1.571e-01	4.003e-02	-3.924	8.95e-05 ***
Retail.Imbalance.l2	-5.026e-02	3.592e-02	-1.399	0.161866
Foreign.Imbalance.l2	-1.101e-01	3.638e-02	-3.026	0.002505 **
Institution.Imbalance.l2	2.332e-02	3.779e-02	0.617	0.537284
trend	5.212e-07	2.916e-07	1.787	0.073984 .

Table 25 Covariance Matrix of Residuals from 3/24/06 to 3/23/16 (Imbalance)

	SET.Change	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
SET.Change	0.0001785	-0.0002944	1.370e-04	1.259e-04
Retail.Imbalance	-0.0002944	0.0012024	-7.574e-04	-3.426e-04
Foreign.Imbalance	0.0001370	-0.0007574	8.280e-04	-4.511e-05
Institution.Imbalance	0.0001259	-0.0003426	-4.511e-05	4.045e-04

Table 26 Correlation Matrix of Residuals from 3/24/06 to 3/23/16 (Imbalance)

	SET.Change	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
SET.Change	1.0000	-0.6355	0.35651	0.46868
Retail.Imbalance	-0.6355	1.0000	-0.75906	-0.49127
Foreign.Imbalance	0.3565	-0.7591	1.00000	-0.07795
Institution.Imbalance	0.4687	-0.4913	-0.07795	1.00000

Table 27 Impulse Response Coefficients from 3/24/06 to 3/23/16 (Imbalance)

	SET.Change	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
[1, [	1.335981e-02	-0.0220308088	0.0102537448	0.0094249893
[2, [	9.893519e-05	-0.0125989253	0.0109246643	0.0014708010
[3,[	5.970686e-04	-0.0040113304	0.0055960422	-0.0022440321
[4, [	1.046794e-04	-0.0033468614	0.0046856410	-0.0015618529
[5, [	2.157098e-04	-0.0019370115	0.0032029261	-0.0013365329

Retail.Imbalance

	SET.Change	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
[1, [	0.000000e+00	0.0267801521	-0.0198513530	-0.0050404330
[2,- [	1.406716e-03	0.0096901147	-0.0089480590	-0.0003114763
[3,- [	2.611384e-04	0.0073841610	-0.0082075084	0.0013160176
[4,- [	3.655272e-04	0.0038696252	-0.0052817163	0.0016435030
[5,- [	1.960159e-04	0.0027003666	-0.0040433133	0.0014641212

Foreign.Imbalance

	SET.Change	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
[1,[	0.000000e+00	0.0000000000	0.0181363247	-0.0133316501
[2,[	2.935087e-04	-0.0001351019	0.0065882079	-0.0059674352
[3,[	2.590965e-04	-0.0018307336	0.0065869233	-0.0046369781
[4,[	2.214681e-04	-0.0013863963	0.0042483709	-0.0027847907
[5,[	1.588103e-04	-0.0013113232	0.0032729011	-0.0019383388
[6,[	1.209194e-04	-0.0009995066	0.0023287002	-0.0013215102
[7,[	8.685268e-05	-0.0007801896	0.0017119740	-0.0009329288
[8,[	6.422027e-05	-0.0005819899	0.0012401427	-0.0006612873
[9,[	4.661014e-05	-0.0004337255	0.0009038742	-0.0004737599
[10,[	3.407260e-05	-0.0003191688	0.0006568564	-0.0003408687
[11,[	2.477948e-05	-0.0002342753	0.0004778938	-0.0002462198

Institution.Imbalance

	SET.Change	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
[1,[	0.000000e+00	0.000000e+00	0.000000e+00	1.060758e-02
[2,[	4.128657e-04	-3.130006e-04	-7.680130e-04	1.530438e-03
[3,[	-2.158841e-04	3.856848e-04	-1.187775e-03	6.583989e-04
[4,[	-4.087506e-05	4.031498e-04	-8.306495e-04	3.877630e-04

] 5,[	-3.580079e-05	2.529170e-04	-5.946956e-04	3.441824e-04

Lower Band, CI= 0.95

SET.Change

	SET.Change	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
] 1,[	1.249466e-02	-0.0233120839	0.0087390935	0.0086432525
] 2, [	-4.964231e-04	-0.0137497704	0.0093437908	0.0004333562
] 3,[	1.625483e-04	-0.0055521663	0.0040364614	-0.0029809544
] 4,[	-1.315224e-04	-0.0041557977	0.0037134345	-0.0020699169
] 5,[	1.216535e-04	-0.0025710202	0.0024575500	-0.0016898137

Retail.Imbalance

	SET.Change	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
] 1,[	0.000000e+00	0.0251329712	-0.0217757834	-0.0059202042
] 2,[	-1.935484e-03	0.0080749281	-0.0102136079	-0.0014377083
] 3,[	-6.842495e-04	0.0060041334	-0.0092992587	0.0006883302
] 4,[	-5.205638e-04	0.0029439885	-0.0062655045	0.0011781596
] 5,[	-3.267550e-04	0.0018978426	-0.0049191692	0.0010300544

Foreign.Imbalance

	SET.Change	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
] 1,[	0.000000e+00	0.0000000000	0.0167693751	-0.0143594953
] 2,[	-2.383644e-04	-0.0015853503	0.0055829089	-0.0066810458
] 3,[	-1.746237e-04	-0.0030352708	0.0056178030	-0.0053673667
] 4,[	5.713717e-05	-0.0023400681	0.0033224266	-0.0033415589
] 5,[	9.712306e-06	-0.0021792416	0.0024536931	-0.0024235643

Institution.Imbalance

	SET.Change	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
] 1,[	0.000000e+00	0.000000e+00	0.0000000000	8.508470e-03
] 2,[	-2.483879e-05	-1.698929e-03	-0.0017381862	8.741071e-04
] 3,[	-7.186331e-04	-1.374589e-03	-0.0023008171	-1.257895e-04
] 4,[	-1.084069e-04	-4.672881e-04	-0.0016232854	3.100345e-05
] 5,[	-7.984015e-05	-2.037402e-04	-0.0012049829	9.634070e-05

Upper Band, CI= 0.95

SET.Change

	SET.Change	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
[1,]	1.427331e-02	-0.0205836442	0.0114464675	0.0101365632
[2,]	6.375842e-04	-0.0107409147	0.0122614177	0.0022505421
[3,]	1.155483e-03	-0.0026855213	0.0071795405	-0.0013397693
[4,]	2.946183e-04	-0.0023923970	0.0055954705	-0.0010379455
[5,]	3.308178e-04	-0.0012911444	0.0040249457	-0.0010050804

Retail.Imbalance

	SET.Change	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
[1,]	0.000000e+00	0.0284806413	-0.0178786492	-0.0040752820
[2,]	-8.808550e-04	0.0110686517	-0.0074277442	0.0005016984
[3,]	1.402787e-04	0.0084501901	-0.0069515751	0.0020948161
[4,]	-2.174546e-04	0.0047586792	-0.0042227041	0.0021412866
[5,]	-3.882571e-05	0.0034313942	-0.0031624594	0.0018537624

Foreign.Imbalance

	SET.Change	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
[1,]	0.000000e+00	0.000000e+00	0.019109436	-0.0120114433
[2,]	7.825048e-04	9.502843e-04	0.007751349	-0.0049662523
[3,]	7.173113e-04	-7.074015e-04	0.007700861	-0.0039303149
[4,]	4.284836e-04	-4.433173e-04	0.005316085	-0.0022844249
[5,]	3.119962e-04	-5.756792e-04	0.004289087	-0.0015651728

Institution.Imbalance

	SET.Chang	Retail.Imbalance	Foreign.Imbalance	Institution.Imbalance
[1,]	0.000000e+00	0.0000000000	0.000000e+00	1.266115e-02
[2,]	9.123865e-04	0.0007506909	1.213309e-04	2.245682e-03
[3,]	2.818685e-04	0.0021078218	2.328320e-04	1.530010e-03
[4,]	5.091624e-05	0.0011214574	-4.494646e-06	7.169753e-04
[5,]	2.299646e-05	0.0007131522	-6.754082e-06	5.816110e-04

Table 28 Estimation Results (Net.1)

SET.Change.1 = SET.Change.1.l1 + Retail.Net.1.l1 + Foreign.Net.1.l1 + Institution.Net.1.l1 + trend

	Estimate	Std .Error	t value	Pr(>|t|)
SET.Change.1.l1	-1.643e-02	3.733e-02	-0.440	0.660

Retail.Net.1.l1	1.419e-06	1.346e-06	1.054	0.292
Foreign.Net.1.l1	1.917e-06	1.345e-06	1.425	0.155
Institution.Net.1.l1	1.312e-06	1.385e-06	0.947	0.344
trend	9.135e-07	6.404e-07	1.426	0.154

Retail.Net.1 = SET.Change.1.l1 + Retail.Net.1.l1 + Foreign.Net.1.l1 + Institution.Net.1.l1 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.1.l1	-2.556e+04	4.891e+03	-5.226	2.04e-07 ***
Retail.Net.1.l1	3.237e-01	1.764e-01	1.836	0.0667 .
Foreign.Net.1.l1	5.894e-02	1.762e-01	0.334	0.7381
Institution.Net.1.l1	2.778e-01	1.815e-01	1.531	0.1261
trend	-3.821e-02	8.389e-02	-0.455	0.6489

Foreign.Net.1 = SET.Change.1.l1 + Retail.Net.1.l1 + Foreign.Net.1.l1 + Institution.Net.1.l1 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.1.l1	3.263e+04	4.213e+03	7.745	2e-14 ***
Retail.Net.1.l1	-1.293e-01	1.519e-01	-0.851	0.39485
Foreign.Net.1.l1	2.273e-01	1.518e-01	1.497	0.13468
Institution.Net.1.l1	-4.218e-01	1.563e-01	-2.698	0.00707 **
trend	-6.707e-03	7.227e-02	-0.093	0.92608

Table 29 Estimation Results (Net.1)

Institution.Net.1 = SET.Change.1.l1 + Retail.Net.1.l1 + Foreign.Net.1.l1 + Institution.Net.1.l1 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.1.l1	-5.436e+03	2.101e+03	-2.588	0.009775 **
Retail.Net.1.l1	-1.496e-01	7.575e-02	-1.975	0.048509 *
Foreign.Net.1.l1	-2.560e-01	7.570e-02	-3.381	0.000744 ***
Institution.Net.1.l1	1.507e-01	7.795e-02	1.933	0.053474 .
trend	2.160e-02	3.603e-02	0.599	0.549034

Table 30 Covariance Matrix of Residuals (Net.1)

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
SET.Change.1	0.000247	-1.959e+01	1.167e+01	7.271e+00
Retail.Net.1	-19.587446	4.239e+06	-3.261e+06	-8.922e+05
Foreign.Net.1	11.671092	-3.261e+06	3.146e+06	1.274e+05
Institution.Net.1	7.271346	-8.922e+05	1.274e+05	7.820e+05

Table 31 Correlation Matrix of Residuals Net.1

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
SET.Change.1	1.0000	-0.6053	0.41867	0.52317
Retail.Net.1	-0.6053	1.0000	-0.89301	-0.49001
Foreign.Net.1	0.4187	-0.8930	1.00000	0.08124
Institution.Net.1	0.5232	-0.4900	0.08124	1.00000

Table 32 Impulse Response Coefficients Net.1

SET.Change.1

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
[1,]	1.571728e-02	-1246.2292450	742.610669	462.560655
[2,]	3.720743e-06	-632.8981806	647.706237	-19.390102
[3,]	3.179472e-04	-172.1928312	237.344479	-74.049456
[4,]	1.082131e-04	-70.4521238	117.818933	-47.877408
[5,]	6.126237e-05	-31.9292976	59.613994	-27.419999

Retail.Net.1

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
[1,]	0.000000e+00	1638.8882864	-1425.140830	-192.6477605
[2,]	-6.589484e-04	393.0390759	-454.551977	90.5787202
[3,]	-1.838907e-04	142.4518073	-213.841717	74.7802372
[4,]	-1.066079e-04	58.9859326	-104.565200	45.6921977
[5,]	-5.502165e-05	28.3504621	-54.144970	25.4048839

Foreign.Net.1

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
[1,]	0.000000e+00	0.0000000	750.668609	-653.6616770
[2,]	5.811283e-04	-137.3421977	446.333630	-290.6360120
[3,]	2.697210e-04	-113.7465351	260.758918	-140.6501027

] 4,[	1.494242e-04	-67.4203031	142.102509	-72.3873072
] 5,[	7.927158e-05	-37.3787061	76.424558	-38.0063915

Institution.Net.1

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
] 1,[	0.000000e+00	0.0000000	0.0000000	322.1231627
] 2,[	4.225979e-04	89.4868597	-135.8827319	48.5349389
] 3,[	-7.673856e-05	23.6420534	-49.1361139	26.4095518
] 4,[	-2.472116e-05	14.0554880	-27.8687087	13.4366738
] 5,[	-1.543639e-05	7.2721395	-14.6258615	7.1896600

Lower Band, CI= 0.95

SET.Change.1

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
] 1,[	1.416682e-02	-1633.710283	500.3802009	394.637749
] 2,[	-9.106961e-04	-832.721888	511.1573949	-71.640614
] 3,[	8.993245e-05	-256.797401	158.7297837	-112.787196
] 4,[	1.389890e-05	-109.985982	75.8963460	-73.670674
] 5,[	4.955069e-06	-55.912135	34.4861559	-40.854008

Retail.Net.1

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
] 1,[	0.000000e+00	1.291753e+03	-1783.220413	-263.5575990
] 2,[	-1.429039e-03	2.706304e+02	-605.496732	22.0343298
] 3,[	-3.824078e-04	7.938018e+01	-287.301096	38.8723463
] 4,[	-2.085632e-04	2.720977e+01	-149.085077	24.2891253
] 5,[	-1.121070e-04	1.014681e+01	-83.041694	12.4995491

Foreign.Net.1

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
] 1,[	0.000000e+00	0.000000	703.2498449	-694.946833
] 2,[	-1.611463e-04	-232.229641	350.7955135	-325.318461
] 3,[	-4.202556e-05	-185.317062	171.6502498	-162.047029
] 4,[	-1.187623e-05	-112.507664	81.1626473	-87.626303
] 5,[	-4.203004e-06	-62.801245	38.0429907	-49.664593

Institution.Net.1

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
] 1,[	0.000000e+00	0.00000000	0.0000000	219.35641376
] 2,[	-5.336679e-04	-25.15381536	-237.9380924	3.87061318
] 3,[	-1.879645e-04	-14.10103045	-101.1816687	7.59835037
] 4,[	-6.905666e-05	0.12625551	-54.4512045	4.36178757
] 5,[	-3.828519e-05	1.07085120	-27.7828951	2.48890701

Upper Band, CI= 0.95

SET.Change.1

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
] 1,[	1.718722e-02	-975.42069543	1089.778823	556.7424220
] 2,[	1.089249e-03	-520.87977920	845.342676	45.4335082
] 3,[	6.428021e-04	-107.34888684	349.751488	-42.4826595
] 4,[	2.238340e-04	-36.57585092	175.774746	-29.7962441
] 5,[	1.331099e-04	-12.78272307	92.481653	-16.6604805

Retail.Net.1

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
] 1,[	0.000000e+00	2026.527411	-1053.4275388	-112.006019
] 2,[	-1.593095e-05	506.329907	-297.5415365	151.155187
] 3,[	2.115697e-06	202.026089	-125.0963511	108.479787
] 4,[	-1.543790e-05	91.733243	-57.3648979	67.603137
] 5,[	-7.290257e-07	48.508533	-29.2443305	39.119488

Foreign.Net.1

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
] 1,[	0.000000e+00	0.0000000	789.828133	-592.9865549
] 2,[	1.379230e-03	-27.5333460	522.679362	-239.2651661
] 3,[	5.765584e-04	-30.1772059	319.873162	-107.6010135
] 4,[	3.183446e-04	-17.5535164	185.070937	-51.9433040
] 5,[	1.713309e-04	-9.2711672	107.095643	-26.1513401

Institution.Net.1

	SET.Change.1	Retail.Net.1	Foreign.Net.1	Institution.Net.1
] 1,[	0.000000e+00	0.0000000	0.00000000	425.1741227

] 2,[	1.120994e-03	195.3440043	-45.88729915	97.5081807
] 3,[	5.400124e-06	61.5147323	-2.62339814	46.7766681
] 4,[	9.334527e-06	29.7554826	-7.78335438	26.3747983
] 5,[	2.306579e-08	16.3362500	-4.33725248	14.5822469

Table 33 Estimation Results (Imbalance.1)

SET.Change.1 = SET.Change.1.l1 + Retail.Imbalance.1.l1 + Foreign.Imbalance.1.l1 + Institution.Imbalance.1.l1 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.1.l1	-1.082e-01	3.667e-02	-2.950	0.00324 **
Retail.Imbalance.1.l1	8.070e-04	3.891e-02	0.021	0.98346
Foreign.Imbalance.1.l1	7.029e-02	3.989e-02	1.762	0.07826 .
Institution.Imbalance.1.l1	6.174e-02	4.228e-02	1.460	0.14443
trend	1.289e-06	6.383e-07	2.019	0.04374 *

Retail.Imbalance.1 = SET.Change.1.l1 + Retail.Imbalance.1.l1 + Foreign.Imbalance.1.l1 + Institution.Imbalance.1.l1 + trend

	Estimate	Std .Error	t value	P>|t|
SET.Change.1.l1	-2.581e-01	9.212e-02	-2.802	0.005157 **
Retail.Imbalance.1.l1	3.347e-01	9.774e-02	3.425	0.000636 ***
Foreign.Imbalance.1.l1	-1.510e-01	1.002e-01	-1.507	0.132011
Institution.Imbalance.1.l1	-8.563e-02	1.062e-01	-0.806	0.420231
trend	1.792e-06	1.603e-06	1.117	0.264075

Foreign.Imbalance.1 = SET.Change.1.l1 + Retail.Imbalance.1.l1 + Foreign.Imbalance.1.l1 + Institution.Imbalance.1.l1 + trend

	Estimate	Std .Error	t value	P>|t|
SET.Change.1.l1	4.365e-01	7.993e-02	5.461	5.74e-08 ***
Retail.Imbalance.1.l1	-2.528e-02	8.481e-02	-0.298	0.7657
Foreign.Imbalance.1.l1	5.392e-01	8.694e-02	6.202	7.64e-10 ***
Institution.Imbalance.1.l1	-4.985e-02	9.215e-02	-0.541	0.5887

trend	-2.981e-06	1.391e-06	- 2.142	0.0324 *

Institution.Imbalance.1 = SET.Change.1.l1 + Retail.Imbalance.1.l1 + Foreign.Imbalance.1.l1 + Institution.Imbalance.1.l1 + trend

	Estimate	Std .Error	t value	P>|t|
SET.Change.1.l1	-1.398e-01	5.122e-02	-2.730	0.00642 **
Retail.Imbalance.1.l1	-2.276e-01	5.434e-02	-4.188	3.02e-05 ***
Foreign.Imbalance.1.l1	-3.253e-01	5.571e-02	-5.839	6.72e-09 ***
Institution.Imbalance.1.l1	1.768e-01	5.905e-02	2.995	0.00280 **
trend	3.809e-07	8.915e-07	0.427	0.66928

Table 34 Covariance Matrix of Residuals from Imbalance.1

	SET.Change.1	Retail. Imbalance.1	Foreign. Imbalance.1	Institution. Imbalance.1
SET.Change.1	0.0002419	-0.0003794	0.0002068	0.0001626
Retail.Imbalance.1	-0.0003794	0.0015263	-0.0010616	-0.0003649
Foreign.Imbalance.1	0.0002068	-0.0010616	0.0011491	-0.0000805
Institution.Imbalance.1	0.0001626	-0.0003649	-0.0000805	0.0004719

Table 35 Correlation Matrix of Residuals from (Imbalance.1)

	SET.Change.1	Retail. Imbalance.1	Foreign. Imbalance.1	Institution. Imbalance.1
SET.Change.1	1.0000	-0.6244	0.3923	0.4813
Retail.Imbalance.1	-0.6244	1.0000	-0.8016	-0.4300
Foreign.Imbalance.1	0.3923	-0.8016	1.0000	-0.1093
Institution.Imbalance.1	0.4813	-0.4300	-0.1093	1.0000

Table 36 Impulse Response Coefficients (Imbalance.1)
SET.Change.1

	SET.Change.1	Retail.Imbalance.1	Foreign.Imbalance.1	Institution.Imbalance.1
] 1,[	1.555338e-02	-2.439527e-02	0.0133001377	1.045383e-02
] 2,[	-1.219576e-04	-1.508369e-02	0.0140556837	8.991410e-04
] 3,[	1.044541e-03	-7.216731e-03	0.0078615881	-9.633879e-04
] 4,[	3.743009e-04	-3.789828e-03	0.0049250904	-1.231350e-03
] 5,[	2.266176e-04	-2.003414e-03	0.0029759986	-1.009689e-03

Retail.Imbalance.1

	SET.Change.1	Retail.Imbalance.1	Foreign.Imbalance.1	Institution.Imbalance.1
] 1,[	0.000000e+00	3.051732e-02	-0.0241605370	-3.599922e-03
] 2,[	-1.895938e-03	1.417121e-02	-0.0136185467	2.774750e-04
] 3,[	-7.236012e-04	7.265425e-03	-0.0085422942	1.519099e-03
] 4,[	-4.225193e-04	3.778493e-03	-0.0051809419	1.495086e-03
] 5,[	-2.231109e-04	2.028120e-03	-0.0031478512	1.148876e-03

Foreign.Imbalance.1

	SET.Change.1	Retail.Imbalance.1	Foreign.Imbalance.1	Institution.Imbalance.1
] 1, [	0.000000e+00	0.000000e+00	0.0197152676	-1.555067e-02
] 2, [	4.256935e-04	-1.645645e-03	0.0114048743	-9.163140e-03
] 3, [	1.885385e-04	-1.598336e-03	0.0068332472	-5.015300e-03
] 4, [	1.489807e-04	-1.186090e-03	0.0040569294	-2.772301e-03
] 5, [	9.692756e-05	-8.107062e-04	0.0024205491	-1.560832e-03

Institution.Imbalance.1

	SET.Change.1	Retail.Imbalance.1	Foreign.Imbalance.1	Institution.Imbalance.1
] 1,[	0.000000e+00	0.000000e+00	0.000000e+00	1.038447e-02
] 2,[	6.411620e-04	-8.891904e-04	-5.176150e-04	1.836353e-03
] 3,[	6.916149e-06	-5.421991e-04	-6.826442e-05	6.058142e-04
] 4,[	3.142021e-05	-2.248305e-04	-5.027628e-05	2.517628e-04
] 5,[	8.429840e-06	-9.732907e-05	-2.025736e-05	1.076487e-04

Lower Band, CI= 0.95

SET.Change.1

	SET.Change.1	Retail.Imbalance.1	Foreign.Imbalance.1	Institution.Imbalance.1
] 1,[	1.418387e-02	-0.0265746441	1.070940e-02	0.0093695060
] 2,[	-8.761240e-04	-0.0179032099	1.180484e-02	-0.0001004801
] 3,[	6.416408e-04	-0.0090326667	5.812514e-03	-0.0018055447
] 4,[	1.616609e-04	-0.0050540034	3.447014e-03	-0.0018311973
] 5,[	8.648241e-05	-0.0029540477	1.974616e-03	-0.0014717820
] 6,[	3.042075e-05	-0.0017605922	1.129885e-03	-0.0010475331
] 7,[	1.259632e-05	-0.0010635360	6.067980e-04	-0.0007352819
] 8,[	4.012943e-06	-0.0006499013	3.232110e-04	-0.0004926253

[9,]	7.263388e-07	-0.0004006295	1.787852e-04	-0.0003227903
[10,]	-6.507831e-07	-0.0002527207	9.908453e-05	-0.0002103483
[11,]	-8.568698e-07	-0.0001616886	5.305710e-05	-0.0001375074

Retail.Imbalance.1

	SET.Change.1	Retail.Imbalance.1	Foreign.Imbalance.1	Institution.Imbalance.1
[1,]	0.000000e+00	2.719945e-02	-0.0267010457	-4.546892e-03
[2,]	-2.621008e-03	1.204472e-02	-0.0154765851	-1.240464e-03
[3,]	-1.051892e-03	5.502536e-03	-0.0103521520	5.004695e-04
[4,]	-6.928089e-04	2.601549e-03	-0.0067562306	7.861234e-04
[5,]	-4.073354e-04	1.209528e-03	-0.0043764619	6.665325e-04

Foreign.Imbalance.1

	SET.Change.1	Retail.Imbalance.1	Foreign.Imbalance.1	Institution.Imbalance.1
[1,]	0.000000e+00	0.0000000000	1.739088e-02	-0.0177532314
[2,]	-3.159061e-04	-0.0038174422	9.394162e-03	-0.0104464988
[3,]	-2.022728e-04	-0.0038535436	4.787999e-03	-0.0061261394
[4,]	-1.267236e-04	-0.0028357390	2.461081e-03	-0.0035675082
[5,]	-7.325248e-05	-0.0019172252	1.242210e-03	-0.0021567381

Institution.Imbalance.1

	SET.Change.1	Retail.Imbalance.1	Foreign.Imbalance.1	Institution.Imbalance.1
[1,]	0.000000e+00	0.000000e+00	0.000000e+00	4.542338e-03
[2,]	-3.115977e-04	-3.160923e-03	-2.639655e-03	1.737933e-04
[3,]	-1.148289e-04	-1.821619e-03	-1.573941e-03	-6.290885e-05
[4,]	-6.394089e-05	-8.803303e-04	-9.536298e-04	-9.029555e-05
[5,]	-3.869909e-05	-4.734644e-04	-5.742297e-04	-1.078184e-04

Upper Band, CI= 0.95

SET.Change.1

	SET.Change.1	Retail.Imbalance.1	Foreign.Imbalance.1	Institution.Imbalance.1
[1,]	1.727781e-02	-2.192631e-02	0.0155316562	1.176444e-02
[2,]	7.689516e-04	-1.294784e-02	0.0169217736	2.102696e-03
[3,]	1.456132e-03	-5.489573e-03	0.0099019883	-2.795689e-04
[4,]	6.246752e-04	-2.635315e-03	0.0063641193	-6.795780e-04
[5,]	4.105245e-04	-1.230136e-03	0.0040432676	-5.644230e-04

Retail.Imbalance.1

	SET.Change.1	Retail.Imbalance.1	Foreign.Imbalance.1	Institution.Imbalance.1
] 1,[	0.000000e+00	0.0336323964	-2.117806e-02	-0.0024432071
] 2,[	-8.876859e-04	0.0164091107	-1.150404e-02	0.0020865013
] 3,[	-3.814465e-04	0.0092489271	-6.653953e-03	0.0025763721
] 4,[	-1.755656e-04	0.0052602038	-3.741717e-03	0.0022360743
] 5,[	-6.895395e-05	0.0031029026	-2.137355e-03	0.0016545616

Foreign.Imbalance.1

	SET.Change.1	Retail.Imbalance.1	Foreign.Imbalance.1	Institution.Imbalance.1
] 1,[	0.000000e+00	0.000000e+00	0.0220119199	-1.322205e-02
] 2,[	1.273015e-03	8.576998e-05	0.0135467030	-7.830017e-03
] 3,[	5.664591e-04	1.205330e-04	0.0088552349	-3.970033e-03
] 4,[	4.020531e-04	1.129621e-04	0.0056173097	-2.084972e-03
] 5,[	2.575254e-04	1.021698e-04	0.0035978208	-1.099559e-03

Institution.Imbalance.1

	SET.Change.1	Retail.Imbalance.1	Foreign.Imbalance.1	Institution.Imbalance.1
] 1,[	0.000000e+00	0.000000e+00	0.000000e+00	1.417597e-02
] 2,[	1.479206e-03	1.248375e-03	1.394427e-03	3.008694e-03
] 3,[	1.578179e-04	7.310883e-04	1.427666e-03	1.192300e-03
] 4,[	1.386102e-04	4.622870e-04	8.263520e-04	5.510661e-04
] 5,[	5.940548e-05	2.726911e-04	5.126889e-04	3.049589e-04

Table 37 Estimation Results from 3/24/2011 to 3/23/2016 (Net.2)

SET.Net.2 = SET.Net.2.l1 + Retail.Net.2.l1 + Foreign.Net.2.l1 + Institution.Net.2.l1 + trend

	Estimate	Std .Error	t value	Pr)>|t|(
SET.Net.2.l1	0.0075819	0.0400774	0.189	0.850
Retail.Net.2.l1	0.0001276	0.0005111	0.250	0.803
Foreign.Net.2.l1	0.0005629	0.0005059	1.113	0.266
Institution.Net.2.l1	0.0003479	0.0004974	0.699	0.484
trend	0.0002844	0.0005686	0.500	0.617

Retail.Net.2 = SET.Net.2.l1 + Retail.Net.2.l1 + Foreign.Net.2.l1 + Institution.Net.2.l1 + trend

	Estimate	Std .Error	t value	Pr)>|t| (
SET.Net.2.l1	-37.18458	7.13477	-5.212	2.2e-07 ***
Retail.Net.2.l1	0.28353	0.09098	3.116	0.00187 **
Foreign.Net.2.l1	0.05347	0.09006	0.594	0.55284
Institution.Net.2.l1	0.13830	0.08855	1.562	0.11857
trend	0.06369	0.10122	0.629	0.52930

Foreign.Net.2 = SET.Net.2.l1 + Retail.Net.2.l1 + Foreign.Net.2.l1 + Institution.Net.2.l1 + trend

	Estimate	Std .Error	t value	Pr)>|t| (
SET.Net.2.l1	26.42319	5.48118	4.821	1.61e-06 ***
Retail.Net.2.l1	-0.23797	0.06989	-3.405	0.000684 ***
Foreign.Net.2.l1	0.15475	0.06919	2.237	0.025492 *
Institution.Net.2.l1	-0.24767	0.06802	-3.641	0.000283 ***
trend	-0.28820	0.07776	-3.706	0.000220 ***

Table 38 Estimation Results from 3/24/2011 to 3/23/2016 (Net.2) (Continued)

Institution.Net.2 = SET.Net.2.l1 + Retail.Net.2.l1 + Foreign.Net.2.l1 + Institution.Net.2.l1 + trend

	Estimate	Std .Error	t value	Pr)>|t|(
SET.Net.2.l1	11.58929	4.47204	2.592	0.00967 **
Retail.Net.2.l1	0.04510	0.05703	0.791	0.42916
Foreign.Net.2.l1	-0.15058	0.05645	-2.667	0.00775 **
Institution.Net.2.l1	0.17388	0.05550	3.133	0.00177 **
trend	0.18938	0.06344	2.985	0.00289 **

Table 39 Covariance Matrix of Residuals from (Net.2)

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
SET.Net.2	189.9	-22409	7790	9376
Retail.Net.2	-22409.4	6020765	-3269793	-2059683
Foreign.Net.2	7790.3	-3269793	3552881	-229993
Institution.Net.2	9376.0	-2059683	-229993	2364942

Table 40 Correlation Matrix of Residuals (Net.2)

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
SET.Net.2	1.0000	-0.6627	0.29989	0.44239

Retail.Net.2	-0.6627	1.0000	-0.70697	-0.54584
Foreign.Net.2	0.2999	-0.7070	0.08124	-0.07934
Institution.Net.2	0.4424	-0.5458	-0.07934	1.00000

Table 41 Impulse Response Coefficients (Net.2)

SET.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
[1,]	1.378307e+01	-1625.8282894	565.5324651	679.9429397
[2,]	4.518969e-01	-849.2215761	670.1987773	119.4818974
[3,]	3.138910e-01	-205.2284304	288.1488824	-113.2042544
[4,]	9.901887e-02	-70.1106149	129.7608517	-68.6906929
[5,]	4.095559e-02	-26.1226154	56.3940133	-33.4973968

Retail.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
[1,]	0.0000000000	1837.7852809	-1278.8625365	-519.2499506
[2,]	-0.6660069911	380.8844418	-506.6330937	185.1652564
[3,]	-0.1772316935	131.2787014	-232.4988657	117.9433900
[4,]	-0.0744442352	47.6926327	-101.1141204	59.3837152
[5,]	-0.0307414865	19.0970790	-43.6717094	26.8392994

Foreign.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
[1,]	0.0000000000	0.00000000	1264.1416029	-1011.7866562
[2,]	0.3596717132	-72.33904771	446.2212565	-366.2794234
[3,]	0.1172753013	-60.68277449	186.4893906	-129.9733993
[4,]	0.0529139438	-29.57060208	78.5898698	-52.0584439
[5,]	0.0227594305	-13.34950824	33.4904221	-21.6061531

Institution.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
[1,]	0.000000e+00	0.00000000	0.00000000	780.85755361
[2,]	2.716312e-01	107.99293153	-193.39880056	135.77663396
[3,]	-4.579832e-02	28.95649336	-82.07854869	60.74884640

[4,]	-2.172470e-02	13.92614845	-35.84853748	23.69732907
[5,]	-1.032455e-02	6.11695839	-15.30483441	9.89475537

Lower Band, CI= 0.95

SET.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
[1,]	13.0866824833	-1810.8990049	404.26071878	565.3466258
[2,]	-0.2504504189	-991.6372597	546.23141299	13.7563230
[3,]	0.0155945098	-273.3681959	217.84880186	-161.1630593
[4,]	-0.0394773945	-105.7751767	93.93470233	-95.7154616
[5,]	-0.0322642756	-43.2241752	36.18469365	-45.9219548

Retail.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
[1,]	0.0000000000	1644.30582507	-1541.5517731	-720.28912316
[2,]	-1.2812570973	224.60840721	-629.5617161	93.64733154
[3,]	-0.3465739416	58.74382301	-301.1391631	80.53843509
[4,]	-0.1687314909	9.56151134	-132.6929177	41.39269423
[5,]	-0.0752669877	0.50100653	-61.2362339	16.93277170

Foreign.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
[1,]	0.000000e+00	0.0000000	1169.31299942	-1102.9914168
[2,]	-4.169754e-01	-179.7699796	341.18526477	-443.5068962
[3,]	-1.798139e-01	-130.0583198	105.54897050	-176.0169726
[4,]	-7.261124e-02	-67.9535554	31.65879929	-74.2596281
[5,]	-2.451926e-02	-33.9607763	8.71494348	-33.6791550

Institution.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
[1,]	0.0000000000	0.000000000	0.0000000	741.36832220
[2,]	-0.4100449208	-33.021154661	-299.2363980	51.01754564
[3,]	-0.1590929293	-45.037922363	-137.6846123	24.77768541
[4,]	-0.0710393558	-11.375710636	-62.5027036	8.97471310
[5,]	-0.0327230134	-4.162906434	-28.4607219	2.72832721

Upper Band, CI= 0.95

SET.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
] 1, [	14.564439807	-1.407553e+03	693.6867830	772.88727523
] 2,[	1.181657126	-7.152478e+02	764.4371406	215.22878292
] 3,[	0.580041411	-1.286455e+02	367.8029044	-67.14215079
] 4,[	0.187543279	-3.007194e+01	170.6514746	-47.59677862
] 5,[	0.087866221	-3.817654e+00	76.7019498	-22.42431230

Retail.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
] 1,[	0.0000000000	2020.4731067	-1.050352e+03	-331.5992410
] 2,[	0.0300042422	505.1307751	-3.635449e+02	274.9988974
] 3,[	0.0647560253	187.8475508	-1.523961e+02	165.5175682
] 4,[	0.0419832232	77.5930496	-6.221435e+01	82.4945707
] 5,[	0.0255375414	34.9684636	-2.442122e+01	38.5252681

Foreign.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
] 1,[	0.0000000000	0.00000000	1331.307383	-9.039354e+02
] 2,[	0.8238651985	80.39787368	543.589696	-2.830053e+02
] 3,[	0.3179757414	42.87335347	258.722465	-8.889325e+01
] 4,[	0.1394851254	18.39847906	123.296100	-3.517219e+01
] 5,[	0.0648664673	8.04453920	58.637378	-1.024664e+01

Institution.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2
] 1,[	0.000000e+00	0.0000000	0.00000000	814.0473658
] 2,[	1.234445e+00	241.4965434	-94.12911965	206.8933668
] 3,[	1.257154e-01	89.6957470	-14.52132028	91.8007736
] 4,[	4.393682e-02	37.1109364	-2.05824039	39.9115312
] 5,[	1.289501e-02	16.1404014	-0.13012730	17.0117717

Table 42 Estimation Results (Imbalance.2)

SET.Change.2 = SET.Change.2.l1 + Retail.Imbalance.2.l1 + Foreign.Imbalance.2.l1 + Institution.Imbalance.2.l1 + trend

	Estimate	Std. Error	t-value	Pr(>|t|)	
SET.Change.2.l1	-1.53E-02	3.68E-02	-0.417	0.6767	
Retail.Imbalance.2.l1	-1.54E-02	7.07E-03	-2.182	0.0293	*
Foreign.Imbalance.2.l1	-2.29E-03	9.34E-03	-0.245	0.8066	
Institution.Imbalance.2.l1	-5.59E-04	1.83E-03	-0.305	0.7603	
trend	2.64E-07	4.40E-07	0.599	0.5491	

Retail.Imbalance.2 = SET.Change.2.l1 + Retail.Imbalance.2.l1 + Foreign.Imbalance.2.l1 + Institution.Imbalance.2.l1 + trend

	Estimate	Std. Error	t-value	Pr(>|t|)	
SET.Change.2.l1	-1.05E+00	1.97E-01	-5.34	1.11E-07	***
Retail.Imbalance.2.l1	2.64E-01	3.78E-02	6.975	4.99E-12	***
Foreign.Imbalance.2.l1	-2.65E-02	5.00E-02	-0.529	0.5967	
Institution.Imbalance.2.l1	1.62E-02	9.81E-03	1.655	0.0981	
trend	2.31E-06	2.35E-06	0.979	0.3277	

Foreign.Imbalance.2 = SET.Change.2.l1 + Retail.Imbalance.2.l1 + Foreign.Imbalance.2.l1 + Institution.Imbalance.2.l1 + trend

	Estimate	Std. Error	t-value	Pr(>|t|)	
SET.Change.2.l1	3.32E-01	1.25E-01	2.658	0.007952	**
Retail.Imbalance.2.l1	-1.12E-01	2.40E-02	-4.668	3.39E-06	***
Foreign.Imbalance.2.l1	1.26E-01	3.17E-02	3.964	7.79E-05	***
Institution.Imbalance.2.l1	-2.18E-02	6.22E-03	-3.51	0.000465	***
trend	-2.49E-06	1.49E-06	-1.671	0.095048	.

Institution.Imbalance.2 = SET.Change.2.l1 + Retail.Imbalance.2.l1 + Foreign.Imbalance.2.l1 + Institution.Imbalance.2.l1 + trend

	Estimate	Std. Error	t-value	Pr(>|t|)	
SET.Change.2.l1	1.78E+00	6.22E-01	2.86	0.00431	**
Retail.Imbalance.2.l1	8.66E-01	1.20E-01	7.239	7.99E-13	***
Foreign.Imbalance.2.l1	-2.08E-02	1.58E-01	-0.131	0.89545	
Institution.Imbalance.2.l1	3.84E-01	3.10E-02	12.399	< 2.00E-16	***
trend	1.96E-05	7.44E-06	2.627	0.00873	**

Table 43 Covariance Matrix of Residuals (Imbalance.2)

	SET. Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2
SET.Change.2	1.15E-04	-0.00039	8.39E-05	0.000826
Retail.Imbalance.2	-3.90E-04	0.003281	-7.41E-04	-0.00507
Foreign.Imbalance.2	8.39E-05	-0.00074	1.32E-03	-0.00034
Institution.Imbalance.2	8.26E-04	-0.00507	-3.43E-04	0.032771

Table 44 Correlation Matrix of Residuals (Imbalance.2)

	SET. Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2
SET.Change.2	1	-0.6366	0.21587	0.42635
Retail.Imbalance.2	-0.6366	1	-0.35659	-0.48926
Foreign.Imbalance.2	0.2159	-0.3566	1	-0.05218
Institution.Imbalance.2	0.4263	-0.4893	-0.05218	1

Table 45 Impulse Response Coefficients (Imbalance.2)

SET.Change.2

	SET.Change.2	Retail.Imbalance.2	Foreign.Imbalance.2	Institution.Imbalance.2
[1,]	1.070676e-02	-3.643859e-02	7.812437e-03	7.705321e-02
[2,]	3.369001e-04	-1.981911e-02	6.927627e-03	1.695848e-02
[3,]	2.752192e-04	-5.491271e-03	2.829842e-03	-1.018279e-02
[4,]	7.970537e-05	-1.978209e-03	1.283342e-03	-8.236623e-03
[5,]	3.096294e-05	-7.733577e-04	5.886772e-04	-4.763180e-03

Retail.Imbalance.2

	SET.Change.2	Retail.Imbalance.2	Foreign.Imbalance.2	Institution.Imbalance.2
[1,]	0.000000e+00	4.420975e-02	-1.035409e-02	-5.137749e-02
[2,]	-6.295358e-04	1.110474e-02	-5.127157e-03	1.873766e-02
[3,]	-1.603904e-04	4.031246e-03	-2.504171e-03	1.580153e-02
[4,]	-6.283244e-05	1.554930e-03	-1.163547e-03	9.329910e-03
[5,]	-2.557794e-05	6.585253e-04	-5.445168e-04	4.844517e-03

Foreign.Imbalance.2

	SET.Change.2	Retail.Imbalance.2	Foreign.Imbalance.2	Institution.Imbalance.2
[1,]	0.000000e+00	0.000000e+00	3.391558e-02	-4.335396e-02
[2,]	-5.334627e-05	-1.601217e-03	5.206401e-03	-1.736842e-02
[3,]	2.332025e-05	-7.861462e-04	1.194419e-03	-8.264993e-03

[4,]	1.365886e-05	-3.976985e-04	4.260394e-04	-3.840635e-03
[5,]	7.098497e-06	-1.929024e-04	1.863298e-04	-1.805028e-03

Institution.Imbalance.2

	SET.Change.2	Retail.Imbalance.2	Foreign.Imbalance.2	Institution.Imbalance.2
[1,]	0.000000e+00	0.000000e+00	0.000000e+00	1.494953e-01
[2,]	-8.360976e-05	2.426770e-03	-3.260982e-03	5.746078e-02
[3,]	-6.082793e-05	1.747204e-03	-1.962351e-03	2.410568e-02
[4,]	-3.501088e-05	9.681447e-04	-9.880272e-04	1.071041e-02
[5,]	-1.812684e-05	4.922368e-04	-4.776950e-04	4.913031e-03

Lower Band, CI= 0.95

SET.Change.2

	SET.Change.2	Retail.Imbalance.2	Foreign.Imbalance.2	Institution.Imbalance.2
[1,]	1.004646e-02	-3.899016e-02	4.874817e-03	0.0650446467
[2,]	-1.850748e-04	-2.344613e-02	4.991185e-03	0.0069549709
[3,]	4.355235e-05	-7.268228e-03	1.885892e-03	-0.0153591696
[4,]	3.181969e-06	-3.021410e-03	8.272616e-04	-0.0111977959
[5,]	-1.032723e-05	-1.401137e-03	3.463428e-04	-0.0063880114

Retail.Imbalance.2

	SET.Change.2	Retail.Imbalance.2	Foreign.Imbalance.2	Institution.Imbalance.2
[1,]	0.000000e+00	4.034039e-02	-1.253261e-02	-6.141653e-02
[2,]	-1.125277e-03	7.988430e-03	-6.706137e-03	9.169625e-03
[3,]	-3.251100e-04	2.420387e-03	-3.306384e-03	1.011889e-02
[4,]	-1.665888e-04	7.586838e-04	-1.691750e-03	5.831853e-03
[5,]	-8.280051e-05	2.278578e-04	-8.675880e-04	2.881979e-03

Foreign.Imbalance.2

	SET.Change.2	Retail.Imbalance.2	Foreign.Imbalance.2	Institution.Imbalance.2
[1,]	0.000000e+00	0.000000e+00	2.737219e-02	-5.406097e-02
[2,]	-6.264162e-04	-4.583086e-03	3.391227e-03	-2.615320e-02
[3,]	-8.855331e-05	-2.133532e-03	4.145279e-04	-1.281308e-02
[4,]	-2.519230e-05	-1.142681e-03	6.618842e-05	-6.376090e-03
[5,]	-8.311487e-06	-6.054732e-04	8.345880e-06	-3.341520e-03

Institution.Imbalance.2

	SET.Change.2	Retail.Imbalance.2	Foreign.Imbalance.2	Institution.Imbalance.2
[1,]	0.000000e+00	0.000000e+00	0.000000e+00	1.428791e-01

[2,]	-5.876437e-04	-3.592986e-05	-5.085405e-03	4.753641e-02
[3,]	-2.926687e-04	-1.393143e-04	-3.366199e-03	1.746272e-02
[4,]	-1.607367e-04	-1.001674e-04	-1.841711e-03	6.804358e-03
[5,]	-8.239321e-05	-5.228871e-05	-9.598511e-04	2.504428e-03

Upper Band, CI= 0.95

SET.Change.2

	SET.Change.2	Retail.Imbalance.2	Foreign.Imbalance.2	Institution.Imbalance.2
[1,]	1.138920e-02	-3.302185e-02	1.142511e-02	8.829787e-02
[2,]	9.315813e-04	-1.638276e-02	9.344621e-03	2.613350e-02
[3,]	5.326651e-04	-3.851599e-03	3.864765e-03	-5.384300e-03
[4,]	1.810692e-04	-1.122084e-03	1.874532e-03	-5.066056e-03
[5,]	8.765873e-05	-4.037918e-04	9.574539e-04	-2.759698e-03

Retail.Imbalance.2

	SET.Change.2	Retail.Imbalance.2	Foreign.Imbalance.2	Institution.Imbalance.2
[1,]	0.000000e+00	4.718692e-02	-8.735249e-03	-0.0390488809
[2,]	-6.314788e-05	1.362411e-02	-2.882515e-03	0.0273648486
[3,]	-3.870472e-06	5.722524e-03	-1.562851e-03	0.0201178147
[4,]	1.892876e-05	2.578272e-03	-6.838903e-04	0.0115439505
[5,]	1.189888e-05	1.306728e-03	-2.909538e-04	0.0063493015

Foreign.Imbalance.2

	SET.Change.2	Retail.Imbalance.2	Foreign.Imbalance.2	Institution.Imbalance.2
[1,]	0.000000e+00	0.000000e+00	4.187261e-02	-3.462260e-02
[2,]	4.756582e-04	1.382767e-03	7.762233e-03	-7.048262e-03
[3,]	1.506257e-04	7.848335e-04	2.254065e-03	-2.746633e-03
[4,]	6.716883e-05	2.428052e-04	9.849373e-04	-1.166813e-03
[5,]	3.222562e-05	8.171191e-05	4.683209e-04	-3.804351e-04

Institution.Imbalance.2

	SET.Change.2	Retail.Imbalance.2	Foreign.Imbalance.2	Institution.Imbalance.2
[1,]	0.000000e+00	0.000000e+00	0.000000e+00	0.1544399711
[2,]	4.607723e-04	5.696279e-03	-1.718481e-03	0.0639626765
[3,]	1.253334e-04	4.225267e-03	-8.685174e-04	0.0295252984
[4,]	5.766222e-05	2.380588e-03	-3.028787e-04	0.0146973605
[5,]	2.254477e-05	1.291097e-03	-9.847903e-05	0.0072974502

Table 46 Covariance Matrix of Residuals (Net, includes Proprietary)

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
SET.Net.2	190	-22440	7811	9382	5247
Retail.Net.2	-22440	6023005	-3269354	-2061698	-691954
Foreign.Net.2	7811	-3269354	3552194	-229812	-53028
Institution.Net.2	9382	-2061698	-229812	2366849	-75340
Proprietary.Net.2	5247	-691954	-53028	-75340	820322

Table 47 Correlation Matrix of Residuals from (Net, includes Proprietary)

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
SET.Net.2	1.0000	-0.6633	0.30065	0.44239	0.42025
Retail.Net.2	-0.6633	1.0000	-0.70682	-0.54605	-0.31130
Foreign.Net.2	0.3006	-0.7068	1.00000	-0.07926	-0.03106
Institution.Net.2	0.4424	-0.5461	-0.07926	1.00000	-0.05407
Proprietary.Net.2	0.4203	-0.3113	-0.03106	-0.05407	1.00000

Table 48 Impulse Response Coefficients (Net, includes Proprietary)

SET.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
[1,[	1.378665e+01	-1627.6471932	566.8990857	680.2142612	380.53396966
[2,[	4.535119e-01	-849.5523232	670.6299465	119.3082513	59.61413034
[3,[	3.104162e-01	-206.1706247	289.2926464	-113.3921808	30.27016209
[4,[	9.840077e-02	-70.4413357	130.3809842	-69.0063197	9.06665846
[5,[	4.084876e-02	-26.2688562	56.7058088	-33.6757045	3.23874690

Retail.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
[1,[	0.0000000000	1836.7853709	-1277.5429226	-519.7219348	-39.52030789
[2,[	-0.6664790305	380.4058169	-505.8417628	184.8147999	-59.37889397
[3,[	-0.1736105753	131.8842959	-233.0341790	117.8257926	-16.67589005
[4,[	-0.0742393539	47.7808427	-101.3275647	59.5249309	-5.97819712
[5,[	-0.0304769882	19.1926485	-43.8364956	26.9109453	-2.26709359

Foreign.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
[1,[	0.0000000000	0.00000000	1264.5806835	-1012.0721237	-2.525087e+02

] 2,[	0.3621728636	-71.8441755	445.7677680	-366.3324935	-7.590955e+00
] 3,[	0.1099007444	-62.2264125	188.1880585	-130.0543617	4.092699e+00
] 4,[	0.0525880832	-29.8717429	79.2971440	-52.5100539	3.084644e+00
] 5,[	0.0226027882	-13.5248729	33.8645519	-21.8180426	1.478358e+00

Institution.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
] 1,[	0.000000e+00	0.00000000	0.00000000	781.15671716	-7.811567e+02
] 2,[	2.718948e-01	108.06895081	-193.51305158	135.83290371	-5.038843e+01
] 3,[	-6.068196e-02	25.74598180	-78.38452823	60.38675737	-7.748201e+00
] 4,[	-2.045986e-02	13.68067028	-34.77467804	22.75642741	-1.662415e+00
] 5,[	-1.000702e-02	5.94108793	-14.82939324	9.57469199	-6.863859e-01

Proprietary.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
] 1,[	0.000000e+00	0.000000000	0.00000000	0.00000000	0.0056239972
] 2,[	-2.389359e-01	-51.870825284	60.12183492	-6.36431079	-1.8868988246
] 3,[	3.121252e-02	-1.748472938	14.89406404	-15.05464918	1.9090652512
] 4,[	2.840110e-03	-3.011744582	7.35508673	-4.58607840	0.2427348500
] 5,[	2.181874e-03	-1.200628513	3.06591351	-2.00786113	0.1425757364

Lower Band, CI= 0.95

SET.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
] 1,[	13.0510060124	-1773.331291	442.04776584	578.2495526	324.322381749
] 2,[	-0.3948001770	-1011.462345	563.51305876	7.5369649	20.224835551
] 3,[	0.0239053862	-286.9321415	223.26028897	-158.6952414	8.759640023
] 4,[	-0.0062492260	-113.0124688	92.73054043	-95.3055274	0.517979019
] 5,[	-0.0145278882	-47.6009425	36.17683255	-45.0428631	-0.206780356

Retail.Net.2

	SET.Net.2	Retail.Net.2	For.Net.2	Inst.Net.2	Prop.Net.2
] 1,[	0.0000000000	1.620024e+03	-1553.5253107	-744.20660722	-80.251613
] 2,[	-1.2193403909	2.463068e+02	-643.9327159	98.12048923	-102.39470
] 3,[	-0.3626794529	6.746018e+01	-312.4158733	77.41531649	-28.866856
] 4,[	-0.1637473935	1.044079e+01	-147.1283576	39.58023374	-12.313817

] 5,[	-0.0763534583	3.228811e+00	-68.7288151	16.11030443	-6.0418508

Foreign.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
] 1,[	0.000000e+00	0.0000000	1.167448e+03	-1113.0488263	-3.039184e+02
] 2,[	-2.802420e-01	-223.8998379	3.374636e+02	-429.8347983	-4.681048e+01
] 3,[	-1.369349e-01	-151.6857335	1.190536e+02	-169.5854396	-1.392176e+01
] 4,[	-4.984712e-02	-73.2799065	4.054423e+01	-70.4417125	-4.094092e+00
] 5,[	-1.863698e-02	-34.7584643	1.293940e+01	-31.5328925	-1.508631e+00

Institution.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
] 1,[	0.000000000	0.000000000	0.0000000	7.366303e+02	-823.92406354
] 2,[	-0.559503127	-21.086583545	-290.2544582	6.081179e+01	-100.74550555
] 3,[	-0.216272800	-34.395326066	-133.4386208	3.053196e+01	-20.56269601
] 4,[	-0.085987586	-6.014227851	-65.0243975	1.142154e+01	-5.64350543
] 5,[	-0.043798642	-1.477944783	-30.6922307	3.507653e+00	-2.46107649
]11,[	-0.000523827	-0.002055101	-0.3559805	2.882959e-03	-0.02593651

Proprietary.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
] 1,[	0.000000e+00	0.00000000	0.00000000	0.00000000	0.005411423
] 2,[	-9.239829e-01	-212.32127961	-39.95018809	-84.85617910	-44.158010346
] 3,[	-4.059844e-02	-59.43562027	-31.30974951	-37.06597323	-3.397115673
] 4,[	-2.184236e-02	-18.61987751	-12.27974602	-18.21959755	-1.724204636
] 5,[	-2.871780e-03	-9.68078475	-5.63782384	-9.27191488	-0.348457667

Upper Band, CI= 0.95

SET.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
] 1,[	14.594928709	-1.439313e+03	679.854277	780.22288604	443.50931167
] 2,[	1.224543396	-6.924006e+02	803.560077	203.70094664	107.44225339
] 3,[	0.595803980	-1.392638e+02	360.860641	-74.08054763	53.11399937
] 4,[	0.231699337	-3.271022e+01	169.943862	-49.16171447	17.85872211
] 5,[	0.108680219	-7.401935e+00	77.934627	-24.18916965	7.47954925

Retail.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
[1,]	0.000000e+00	2031.7790208	-1.043479e+03	-311.1945944	21.359112263
[2,]	-1.996255e-02	512.7823689	-3.747219e+02	290.7676958	-14.807033605
[3,]	2.431380e-02	202.2558227	-1.700008e+02	159.8570167	-1.202572202
[4,]	2.266191e-02	85.3132985	-6.928136e+01	82.5210462	0.426127133
[5,]	1.767544e-02	39.5281860	-2.459997e+01	37.0396436	0.744198644

Foreign.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
[1,]	0.000000000	0.000000000	1344.6295755	-8.861607e+02	-199.6452146
[2,]	0.994064555	38.755483731	537.1778484	-2.754801e+02	35.3672245
[3,]	0.367209273	18.002437759	257.9690562	-8.500500e+01	21.5500341
[4,]	0.166203901	8.021492085	125.3565409	-3.564718e+01	10.5030922
[5,]	0.077819150	3.410455951	61.3994429	-1.323957e+01	5.1942526

Institution.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
[1,]	0.000000e+00	0.0000000	0.000000e+00	823.9240978	- 7.366303e+02
[2,]	8.781418e-01	228.0639791	-1.036309e+02	208.0924854	-2.467496e+00
[3,]	8.127906e-02	84.6246093	-3.024876e+01	88.5975488	2.998374e+00
[4,]	2.540138e-02	39.3430759	-1.108074e+01	35.7401540	2.060751e+00
[5,]	8.097275e-03	18.5707758	-2.388291e+00	16.7285739	6.318442e-01

Proprietary.Net.2

	SET.Net.2	Retail.Net.2	Foreign.Net.2	Institution.Net.2	Proprietary.Net.2
[1,]	0.0000000000	0.00000000	0.0000000	0.00000000	0.005803780
[2,]	0.7548024563	74.38755311	163.7023757	81.20606667	48.068837974
[3,]	0.1101542851	45.22931036	81.5037026	6.81750366	9.131484194
[4,]	0.0322551138	8.05816694	37.5624528	7.15245101	2.977244340
[5,]	0.0122715886	2.55889512	16.3042538	3.60103202	1.284919935

Table 49 Estimation Results (Imbalance, includes Proprietary)
SET.Change.2 = SET.Change.2.l1 + Retail.Imbalance.2.l1 + Foreign.Imbalance.2.l1 + Institution.Imbalance.2.l1 + Proprietary.Imbalance.2.l1 + trend

	Estimate	Std .Error	t value	Pr>|t|

SET.Change.2.l1	4.622e-03	3.903e-02	0.118	0.906
Retail.Imbalance.2.l1	-1.759e+03	3.589e+03	-0.490	0.624
Foreign.Imbalance.2.l1	-1.759e+03	3.589e+03	-0.490	0.624
Institution.Imbalance.2.l1	-1.759e+03	3.589e+03	-0.490	0.624
Proprietary.Imbalance.2.l1	-1.759e+03	3.589e+03	-0.490	0.624
trend	2.975e-07	4.413e-07	0.674	0.500

Retail.Imbalance.2 = SET.Change.2.l1 + Retail.Imbalance.2.l1 + Foreign.Imbalance.2.l1 + Institution.Imbalance.2.l1 + Proprietary.Imbalance.2.l1 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.2.l1	-5.427e-01	1.091e-01	-4.976	7.41e-07 ***
Retail.Imbalance.2.l1	-1.039e+04	1.003e+04	-1.036	0.301
Foreign.Imbalance.2.l1	-1.039e+04	1.003e+04	-1.036	0.301
Institution.Imbalance.2.l1	-1.039e+04	1.003e+04	-1.036	0.301
Proprietary.Imbalance.2.l1	-1.039e+04	1.003e+04	-1.036	0.301
trend	9.744e-07	1.233e-06	0.790	0.430

Foreign.Imbalance.2 = SET.Change.2.l1 + Retail.Imbalance.2.l1 + Foreign.Imbalance.2.l1 + Institution.Imbalance.2.l1 + Proprietary.Imbalance.2.l1 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.2.l1	4.193e-01	8.642e-02	4.852	1.38e-06 ***
Retail.Imbalance.2.l1	1.112e+04	7.946e+03	1.399	0.16206
Foreign.Imbalance.2.l1	1.112e+04	7.946e+03	1.399	0.16204
Institution.Imbalance.2.l1	1.112e+04	7.946e+03	1.399	0.16206
Proprietary.Imbalance.2.l1	1.112e+04	7.946e+03	1.399	0.16205
trend	-3.395e-06	9.771e-07	-3.474	0.00053 ***

Institution.Imbalance.2 = SET.Change.2.l1 + Retail.Imbalance.2.l1 + Foreign.Imbalance.2.l1 + Institution.Imbalance.2.l1 + Proprietary.Imbalance.2.l1 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.2.l1	1.481e-01	6.784e-02	2.184	0.02919 *
Retail.Imbalance.2.l1	2.063e+03	6.238e+03	0.331	0.74091
Foreign.Imbalance.2.l1	2.063e+03	6.238e+03	0.331	0.74093

Institution.Imbalance.2.l1	2.063e+03	6.238e+03	0.331	0.74089
Proprietary.Imbalance.2.l1	2.063e+03	6.238e+03	0.331	0.74091
trend	2.131e-06	7.671e-07	2.778	0.00556 **

Proprietary.Imbalance.2 = SET.Change.2.l1 + Retail.Imbalance.2.l1 + Foreign.Imbalance.2.l1 + Institution.Imbalance.2.l1 + Proprietary.Imbalance.2.l1 + trend

	Estimate	Std .Error	t value	Pr>|t|
SET.Change.2.l1	-2.467e-02	4.561e-02	-0.541	0.589
Retail.Imbalance.2.l1	-2.794e+03	4.194e+03	-0.666	0.505
Foreign.Imbalance.2.l1	-2.794e+03	4.194e+03	-0.666	0.505
Institution.Imbalance.2.l1	-2.794e+03	4.194e+03	-0.666	0.505
Proprietary.Imbalance.2.l1	-2.794e+03	4.194e+03	-0.666	0.505
trend	2.897e-07	5.157e-07	0.562	0.574

Table 50 Covariance Matrix of Residuals (Imbalance, includes Proprietary)

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
SET.Change.2	1.145e-04	-0.0002072	6.761e-05	8.731e-05	5.225e-05
Retail. Imbalance.2	-2.072e-04	0.0008942	-4.864e-04	-2.993e-04	-1.085e-04
Foreign. Imbalance.2	6.761e-05	-0.0004864	5.614e-04	-3.686e-05	-3.818e-05
Institution. Imbalance.2	8.731e-05	-0.0002993	-3.686e-05	3.459e-04	-9.739e-06
Proprietary. Imbalance.2	5.225e-05	-0.0001085	-3.818e-05	-9.739e-06	1.564e-04

Table 51 Correlation Matrix of Residuals (Imbalance, includes Proprietary

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
SET.Change.2	1.0000	-0.6475	0.26665	0.43873	0.39045
Retail. Imbalance.2	-0.6475	1.0000	-0.68649	-0.53816	-0.29011
Foreign. Imbalance.2	0.2666	-0.6865	1.00000	-0.08364	-0.12883
Institution.	0.4387	-0.5382	-0.08364	1.00000	-0.04187

Imbalance.2					
Proprietary. Imbalance.2	0.3904	-0.2901	-0.12883	-0.04187	1.00000

Table 52 Impulse Response Coefficients (Imbalance, includes Proprietary)

SET.Change.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
[1,]	1.070237e-02	-1.935060e-02	6.320398e-03	8.150221e-03	4.879983e-03
[2,]	3.365096e-04	-1.048441e-02	8.116960e-03	1.959506e-03	4.079405e-04
[3,]	2.768286e-04	-2.906304e-03	3.684545e-03	-1.086841e-03	3.086001e-04
[4,]	8.767568e-05	-1.063747e-03	1.811353e-03	-8.557941e-04	1.081881e-04
[5,]	3.699717e-05	-4.272824e-04	8.715457e-04	-4.892275e-04	4.496448e-05

Retail.Imbalance.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
[1,]	0.000000e+00	2.280104e-02	-1.596566e-02	-6.216426e-03	-6.189453e-04
[2,]	-5.942596e-04	5.695286e-03	-6.817760e-03	1.787924e-03	-6.654508e-04
[3,]	-1.660718e-04	2.079365e-03	-3.399414e-03	1.529160e-03	-2.091120e-04
[4,]	-7.089472e-05	8.180554e-04	-1.634969e-03	9.032233e-04	-8.631074e-05
[5,]	-3.092357e-05	3.546742e-04	-7.850624e-04	4.678174e-04	-3.742946e-05

Foreign.Imbalance.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
[1,]	0.000000e+00	0.000000e+00	1.632861e-02	-1.149499e-02	-4.833624e-03
[2,]	3.322145e-04	-9.722504e-04	6.233325e-03	-5.243413e-03	-1.765608e-05
[3,]	8.213696e-05	-9.921802e-04	3.029744e-03	-2.112399e-03	7.483683e-05
[4,]	4.927891e-05	-5.286228e-04	1.430426e-03	-9.577268e-04	5.592472e-05
[5,]	2.389143e-05	-2.681781e-04	6.829700e-04	-4.431424e-04	2.835083e-05

Institution.Imbalance.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
[1,]	0.000000e+00	0.000000e+00	0.000000e+00	1.043385e-02	-1.043385e-02

] 2,[	3.096063e-04	1.160599e-03	-2.709342e-03	2.050520e-03	-5.017744e-04
] 3,[	-4.224182e-05	3.173734e-04	-1.174723e-03	9.550813e-04	-9.773202e-05
] 4,[	-1.601370e-05	2.050398e-04	-5.777626e-04	3.964543e-04	-2.373171e-05

Proprietary.Imbalance.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
] 1,[	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	8.516161e-08
] 2,[	-1.497863e-04	-8.845217e-04	9.467217e-04	1.756981e-04	-2.379019e-04
] 3,[	4.036035e-05	-1.027343e-04	2.430819e-04	-1.718012e-04	3.145387e-05
] 4,[	3.416701e-06	-6.997925e-05	1.372106e-04	-7.194976e-05	4.718483e-06
] 5,[	2.696631e-06	-2.827212e-05	6.404374e-05	-3.889977e-05	3.128173e-06

Lower Band, CI= 0.95

SET.Change.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
] 1,[	1.001559e-02	-2.085684e-02	5.180270e-03	6.956344e-03	4.306903e-03
] 2,[	-3.249020e-04	-1.258882e-02	6.580001e-03	9.527924e-04	-3.560703e-04
] 3,[	-2.300393e-05	-4.003984e-03	2.687202e-03	-1.647230e-03	6.342958e-05
] 4,[	-1.099118e-05	-1.647533e-03	1.269833e-03	-1.224364e-03	4.566275e-06
] 5,[	-7.250314e-06	-7.578248e-04	5.616123e-04	-7.190243e-04	-3.058727e-06

Retail.Imbalance.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
] 1,[	0.000000e+00	2.036991e-02	-1.819678e-02	-8.028878e-03	-1.391035e-03
] 2,[	-1.158994e-03	4.356945e-03	-8.235793e-03	5.613585e-04	-1.295153e-03
] 3,[	-3.239062e-04	1.292250e-03	-4.506461e-03	8.914892e-04	-3.780283e-04
] 4,[	-1.574390e-04	3.971559e-04	-2.316787e-03	5.909122e-04	-1.861549e-04
] 5,[	-7.642838e-05	1.109274e-04	-1.186521e-03	2.837117e-04	-9.027166e-05

Foreign.Imbalance.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
] 1,[	0.000000e+00	0.000000e+00	1.528532e-02	-1.264407e-02	-5.637495e-03

] 2,[	-2.002765e-04	-2.374146e-03	4.928329e-03	-6.111918e-03	-5.746941e-04
] 3,[	-1.518902e-04	-1.921618e-03	2.019190e-03	-2.711363e-03	-1.674456e-04
] 4,[	-5.547095e-05	-1.043469e-03	8.045587e-04	-1.292264e-03	-4.348730e-05
] 5,[	-2.519636e-05	-5.451042e-04	3.108595e-04	-6.385291e-04	-1.950181e-05

Institution.Imbalance.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
] 1,[	0.000000e+00	0.000000e+00	0.000000e+00	9.766331e-03	-1.087183e-02
] 2,[	-2.304618e-04	-2.302042e-04	-3.904355e-03	1.090704e-03	-1.067839e-03
] 3,[	-1.225169e-04	-3.933222e-04	-1.817640e-03	5.347368e-04	-2.455711e-04
] 4,[	-6.533388e-05	-1.009270e-04	-9.406272e-04	1.624944e-04	-8.010667e-05
] 5,[	-3.340740e-05	-2.843347e-05	-5.046032e-04	5.272207e-05	-4.006681e-05

Proprietary.Imbalance.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
] 1,[	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	8.050200e-08
] 2,[	-7.964568e-04	-2.741682e-03	-2.508963e-04	-8.814593e-04	-8.966436e-04
] 3,[	-1.638701e-05	-7.610652e-04	-3.162784e-04	-5.090800e-04	-2.503503e-05
] 4,[	-1.439391e-05	-2.992231e-04	-1.417578e-04	-2.736242e-04	-1.547733e-05
] 5,[	-4.392099e-06	-1.259245e-04	-7.267126e-05	-1.488938e-04	-4.321840e-06

Upper Band, CI= 0.95

SET.Change.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
] 1,[	1.146016e-02	-1.814419e-02	0.0079048198	9.209670e-03	5.500060e-03
] 2,[	1.075108e-03	-8.649590e-03	0.0097833210	2.860262e-03	1.078276e-03
] 3,[	5.475465e-04	-1.998711e-03	0.0048459827	-5.777176e-04	5.466665e-04
] 4,[	1.837574e-04	-6.593188e-04	0.0025433048	-5.546711e-04	2.125408e-04
] 5,[	8.482395e-05	-1.972433e-04	0.0012989869	-3.306969e-04	9.894556e-05

Retail.Imbalance.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2

] 1,[	0.000000e+00	2.459192e-02	-1.351431e-02	-4.635066e-03	1.139223e-04
] 2,[	4.926100e-05	6.831526e-03	-5.365417e-03	2.805846e-03	-7.279954e-05
] 3,[	1.151343e-05	2.945895e-03	-2.497143e-03	2.065196e-03	-1.146542e-05
] 4,[	1.433991e-05	1.305224e-03	-1.134368e-03	1.208430e-03	7.359143e-06
] 5,[	1.343222e-05	6.485231e-04	-5.222511e-04	6.679109e-04	1.244101e-05

Foreign.Imbalance.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
] 1,[	0.000000e+00	0.000000e+00	1.711183e-02	-1.025686e-02	-3.936533e-03
] 2,[	7.702008e-04	7.186809e-04	7.407952e-03	-4.416241e-03	7.377202e-04
] 3,[	2.807375e-04	1.161020e-04	4.003359e-03	-1.568354e-03	3.702316e-04
] 4,[	1.461789e-04	5.385993e-05	2.083419e-03	-6.560916e-04	1.878584e-04
] 5,[	7.278427e-05	1.802849e-05	1.080028e-03	-2.728701e-04	9.062047e-05

Institution.Imbalance.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
] 1,[	0.000000e+00	0.000000e+00	0.000000e+00	1.087183e-02	-9.766332e-03
] 2,[	8.555878e-04	2.648864e-03	-1.210119e-03	3.106569e-03	1.519725e-04
] 3,[	5.198173e-05	9.984303e-04	-2.171887e-04	1.409913e-03	1.392263e-06
] 4,[	3.398245e-05	5.187064e-04	-6.571323e-05	5.974282e-04	2.535729e-05
] 5,[	8.792313e-06	2.751458e-04	-2.488930e-05	2.887132e-04	8.238894e-06

Proprietary.Imbalance.2

	SET.Change.2	Retail. Imbalance.2	Foreign. Imbalance.2	Institution. Imbalance.2	Proprietary. Imbalance.2
]1,[	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	8.983807e-08
]2,[	4.351865e-04	7.111220e-04	2.404288e-03	1.379114e-03	6.130174e-04
]3,[	9.964286e-05	5.193540e-04	1.000138e-03	1.175483e-04	1.093035e-04
]4,[	3.372152e-05	9.313350e-05	4.779613e-04	8.427877e-05	3.537086e-05
]5,[	1.585530e-05	3.837479e-05	2.331178e-04	3.893382e-05	1.673388e-05

Table 53 ADF and KPSS Test Results

	adf.test	KPSS
SET.Change	p-value =0.01	p-value =0.1
Foreign.Net	p-value =0.01	p-value =0.05141
Retail.Net	p-value =0.01	p-value =0.1
Institution.Net	p-value =0.01	p-value =0.01
Foreign.Imbalance	p-value =0.01	p-value =0.1
Retail.Imbalance	p-value =0.01	p-value =0.1
Institution.Imbalance	p-value =0.01	p-value =0.1
Proprietary.Net.2	p-value =0.01	p-value =0.1
Proprietary.Imbalance.2	p-value =0.01	p-value =0.1

Note: MLR = minimum loan rate, DJ = Dow Jones, NK = Nikkei, TS = term structure, RP = risk premia, IP = industrial production growth, EI = expected inflation, UI = unanticipated inflation, and Prop. = proprietary.

Table 54 Correlation Matrices for Monthly Variables

Table 54 **Correlation Matrices for Monthly Variables**

Symbol	Market	Retail	Foreign	Institution	MLR	DJ	NK	TS	RP	IP	EI	Propr.
						A. Thailand						
Retail	-0.1465	1										
Foreign	0.1467	-0.3356	1									
Institution	0.0184	-0.7023	-0.3846	1								
MLR	0.1621	0.1093	0.2934	-0.3547	1							
DJ	0.0492	0.0910	-0.0195	-0.0699	0.1468	1						
NK	0.0593	-0.0102	-0.0389	0.0249	0.1532	0.5582	1					
TS	-0.2262	0.1372	-0.2774	0.1232	-0.5564	0.0857	0.0009	1				
RP	-0.2101	0.3471	-0.2219	-0.1162	0.2244	-0.0484	0.0520	0.1502	1			
IP	-0.1240	0.3539	-0.1141	-0.2615	0.0425	-0.0698	-0.2533	-0.0638	-0.0990	1		
EI	0.2683	-0.0900	0.4351	-0.2642	0.7403	0.1526	0.1932	-0.3926	-0.2142	0.0418	1	
UI	-0.2107	0.1323	-0.4350	0.2525	-0.5987	-0.0507	-0.1856	0.3437	0.2872	-0.0339	-0.9077	1
Prop.	0.0831	-0.1387	0.0759	-0.1910	0.1684	-0.0186	0.0436	-0.2382	-0.2486	-0.0134	0.1885	-0.2959
						B. Malaysia						
Retail	-0.0739	1										
Foreign	0.2572	-0.6406	1									
Institution	-0.2724	0.3606	-0.9426	1								
MLR	-0.2823	0.1301	-0.2244	0.1942	1							
DJ	0.0777	0.2715	-0.2328	0.1810	0.0489	1						
NK	0.1251	-0.1042	-0.1428	0.2246	0.0481	0.6062	1					
TS	-0.0840	0.2170	-0.0657	-0.0337	0.1892	-0.1304	-0.2928	1				
RP	0.2508	-0.1340	0.0027	0.0911	-0.2858	0.1296	0.2247	-0.7435	1			
IP	0.1075	0.0726	0.0200	-0.0636	-0.0578	0.1507	0.0778	-0.1350	0.0441	1		
EI	0.0047	0.0658	-0.0389	0.0123	-0.0394	0.0440	0.0705	-0.3471	0.0677	0.0430	1	
UI	-0.1012	0.0043	-0.1014	0.1205	0.0990	-0.0916	-0.0661	0.2849	-0.0210	0.0597	-0.8387	N/A

Table 55 Monthly Summary Statistics

	Mean	Median	Stdev	Min	Max
Thailand					
Market	-0.0015	-0.011	0.0408	-0.064	0.1
TS	0.0152	0.0168	0.0042	0.0047	0.0202
RP	0.0133	0.0133	0.002	0.0091	0.0185
IP	-0.0016	-0.0021	0.0831	-0.2292	0.1773
EI	0.0265	0.029	0.0061	0.0095	0.0365
UI	-0.0258	-0.027	0.0055	-0.0346	-0.008
MLR	0.0682	0.0675	0.0022	0.0650	0.0713
DJ	0.0081	0.0097	0.0291	-0.0666	0.0622
NK	0.0072	0.0084	0.0354	-0.0971	0.0771
Retail	-370.3491	327.4	2865.3441	-13608.79	3952.85
Foreign	481.1954	15.72	2034.4718	-2571.57	5698.23
Institution	152.8417	7.63	2948.7626	-6736.29	15693.24
Proprietary	-263.6839	-320.085	806.21	-1913.56	2196.12
Malaysia					
Market	-0.0005	-0.005	0.0225	-0.0463	0.0685
TS	0.0116	0.0105	0.0033	0.0071	0.0186
RP	0.069	0.0688	0.0032	0.0629	0.0742
IP	0.0009	-0.0008	0.0466	-0.0938	0.1203
EI	0.0287	0.028	0.0056	0.02	0.04
UI	-0.0266	-0.0252	0.0073	-0.0493	-0.0131
MLR	0.031	0.03	0.0012	0.03	0.0325
DJ	0.012	0.0096	0.0303	-0.0937	0.0737
NK	0.011	0.0212	0.0379	-0.1232	0.0697
Retail	-31.6515	-32.06	54.9583	-253.85	105.49
Foreign	87.8761	101.655	253.1390	-464.35	714.85
Institution	-23.3548	-30.065	200.1496	-525.600	398.800

Note: TS = term structure, RP = risk premia, IP = industrial production growth, EI = expected inflation, UI = unanticipated inflation, MLR = minimum loan rate, DJ = Dow Jones, NK = Nikkei, and market are the country's stock exchange. The percent data are all in decimal format.

Table 56 Autocorrelations of the Economic Variables

Symbol	ρ1	ρ2	ρ3	ρ4	ρ5	ρ6	ρ7	ρ8	ρ9	ρ10	ρ11	ρ12	B/P (24)
						A. Thailand							
TS	.9926	-.1054	-.1737	-.1699	.1837	.1203	-.2653	-.1132	.3473	-.2067	.0438	.0129	116.18
RP	.6797	.2127	-.1652	-.1585	.1467	-.1258	-.0914	.2009	-.0622	-.1768	.1346	-.1148	76.95
IP	-.5144	-.5316	-.3777	-.2369	-.2276	-.1072	-.0957	-.2046	-.1984	-.3212	-.4199	.4124	120.03
EI	1.0115	.0225	-.0832	.0707	-.0221	-.0657	-.0107	.0370	-.1908	.3185	.0197	-.0133	97.51
UI	.7565	-.1318	.3354	.3473	-.1420	.0786	-.2531	-.2484	-.1176	.2186	.1058	.1587	74.76
						B. Malaysia							
TS	-.2931	-1.2872	-.6486	-1.3995	-.1958	1.0986	.9586	-.6862	-.3961	-.5435	-1.2054	-2.3286	167.27
RP	.8161	-.0840	-.1534	.1552	-.0666	.3098	-.2206	-.1133	.4475	-.5311	-.0437	.0833	99.41
IP	-1.1704	-1.1578	-1.1309	-1.1545	-1.1508	-1.0181	-.8816	-.8991	-.7730	-.7483	-.7920	-.0517	57.54
EI	1.1427	-.0757	-.1924	.0296	-.1008	-.0380	.1065	.1123	-.1649	.0633	.1397	-.3214	180.84
UI	1.4579	-1.0531	.3725	.3722	-.7467	.3916	.1945	-.3735	.1170	.0416	-.1432	-.0475	95.00

Note: TS = term structure, RP = risk premia, IP = industrial production growth, EI = expected inflation, and UI = unanticipated inflation. The Box-Pierce X^2 statistic is also given based on the traditional 24 lag autocorrelation coefficients.

Table 57 Economic Variables and Pricing, Cross-sectional Approach

	Thailand (A)					**Malaysia (B)**				
	Multivariate	Cross-sectional				Multivariate	Cross-sectional			
		(1)	(2)	(3)	(4)		(1)	(2)	(3)	(4)
Comp.	-0.008 (0.035)**					0.002 (0.381)				
TS		1.267 (0.417)					-2.422 (0.158)			
RP		4.190 (0.192)	4.853 (0.115)				-3.518 (0.034)**	-1.642 (0.115)		1.580 (0.133)
IP		0.074 (0.301)	0.082 (0.258)				-0.097 (0.182)	-0.061 (0.386)		
EI		-2.864 (0.239)			1.929 (0.218)		1.064 (0.3361)			
UI		-2.063 (0.434)					1.314 (0.123)			
MLR				2.944 (0.318)	-0.663 (0.878)				-5.260 (0.0552)*	-3.034 (0.2733)
DJ				0.013 (0.959)					0.009 (0.9486)	
NK				0.034 (0.871)					0.078 (0.4785)	
Retail					-1.66E-06 (0.449)					
Institution										-2.92E-05 (0.0787)*

Note: Comp. = principal component, TS = term structure, RP = risk premia, IP = industrial production growth, EI = expected inflation, UI = unanticipated inflation, MLR = minimum loan rate, DJ = Dow Jones, and NK = Nikkei. (p-values) 10% significance = '*', and 5% significance = '**'. An example of a cross-sectional model, model (1) takes the form:

$$\bar{R} = \lambda_0 + \lambda_j TS_j + \lambda_j RP_j + \lambda_j IP_j + \lambda_j EI_j + \lambda_j UI_j + \varepsilon \qquad (1)$$

FIGURES 5 TO 14

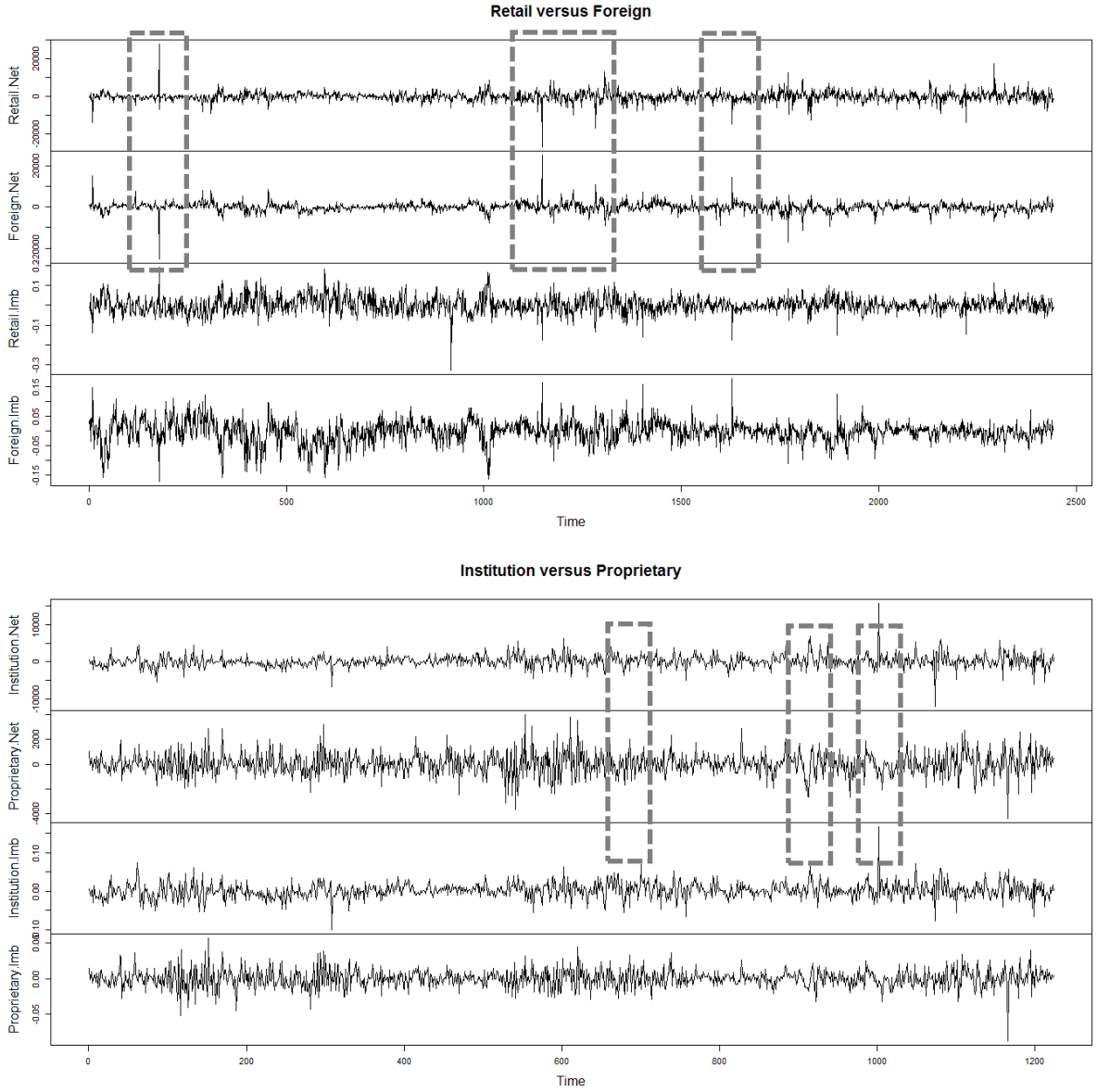

Figure 3 Time Path of the Variables

Note: Retail versus foreign displays the full sample, whereas the institution versus proprietary displays the second subsample period of 2011 to 2016. The movements by retail are met with reverse mirrored movements by foreign investors (buying and selling from each other). This is important in demonstrating that the foreign investors provide liquidity for the retail traders. In the second highlighted box it is noticeable that the retail group had been selling off and the

prices were supported by the buying of the foreigners. These graphs illustrate and support the findings in the regressions, contemporaneous correlation and summary statistics. The institution and dealer accounts are not as transparent; however a reversed mirror relationship still exists. For example, at the 1000 day mark the institutional trading had spiked upward and the dealers were selling off. Also at about the 920 day mark, there begins a several day selloff, appearing as a wide downward spike in the proprietary group that is met with a several day buy up by institutional holders.

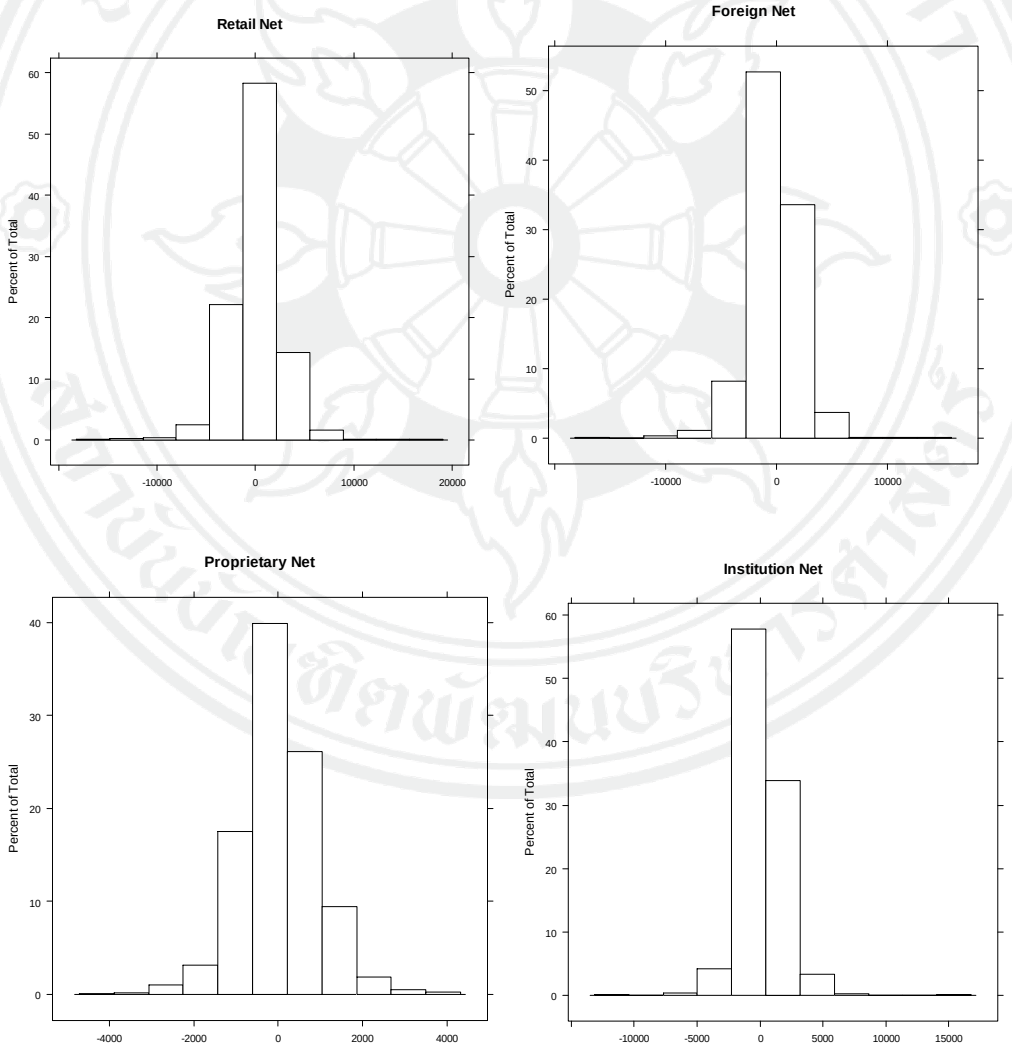

Figure 4 Histograms of Data Series Used

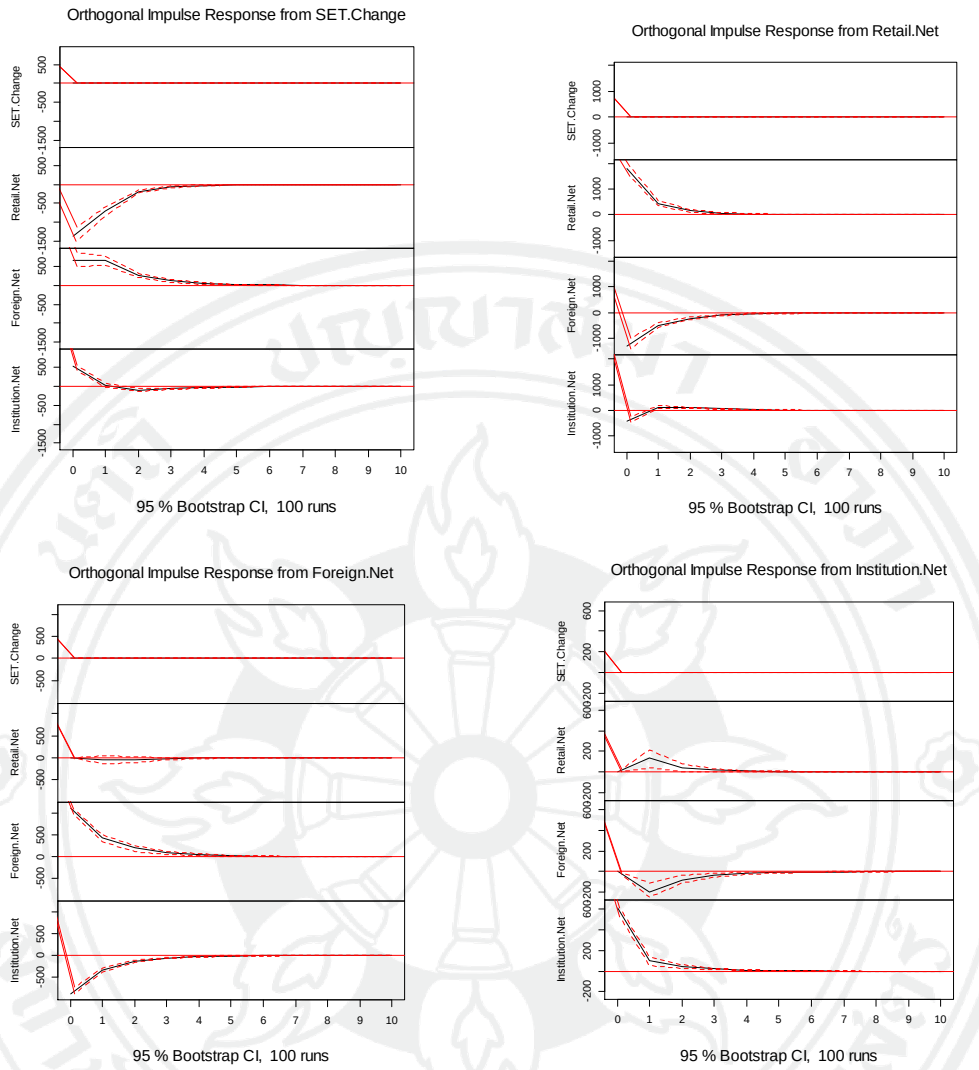

Figure 5 Impulse Response Graphs from 3/24/06 to 3/23/16 (Net)

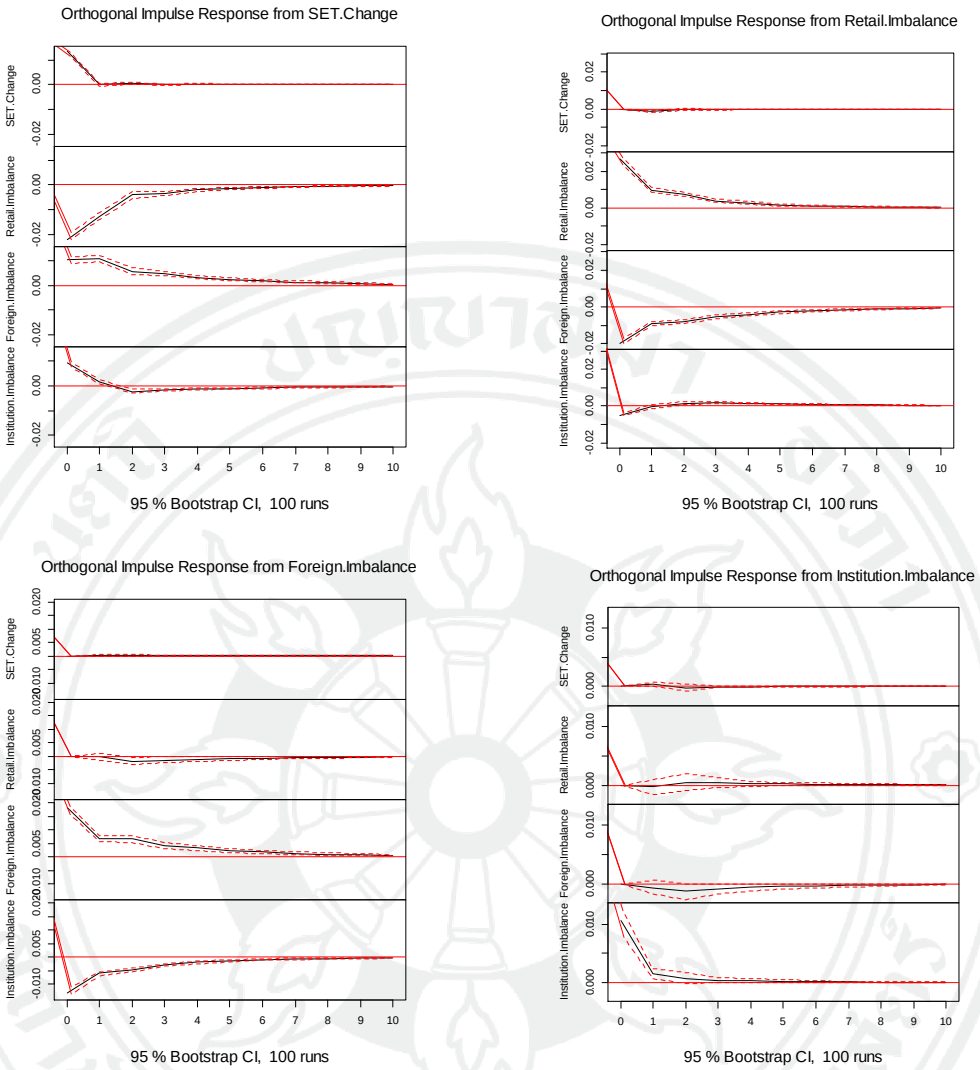

Figure 6 Impulse Response Graphs from 3/24/06 to 3/23/16 (Imbalance)

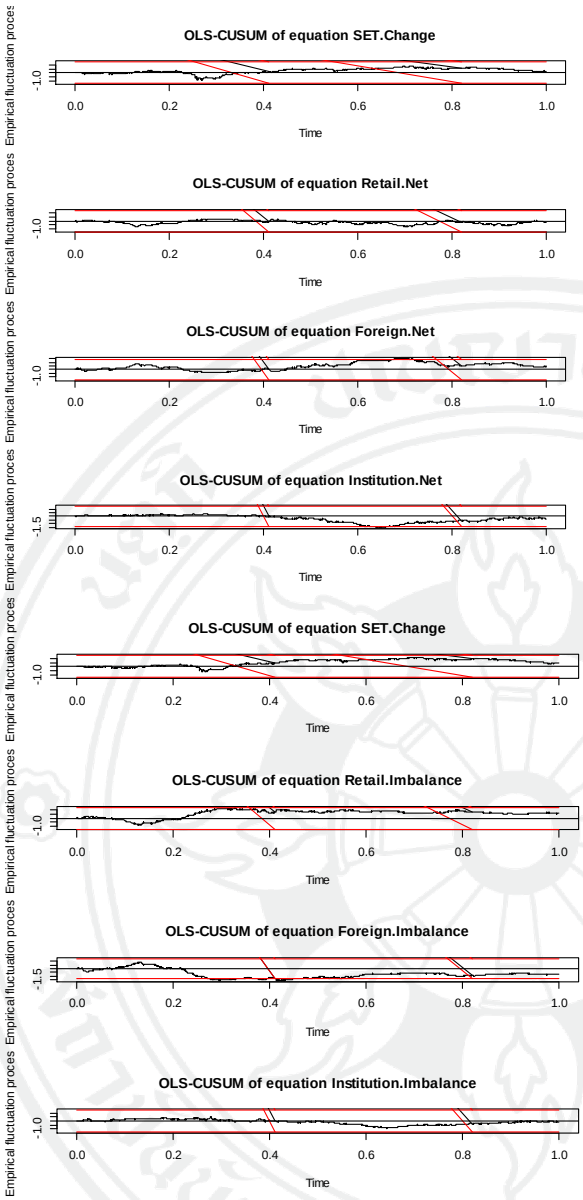

Figure 7 Diagnostics from 3/24/06 to 3/23/16 (Net and Imbalance)

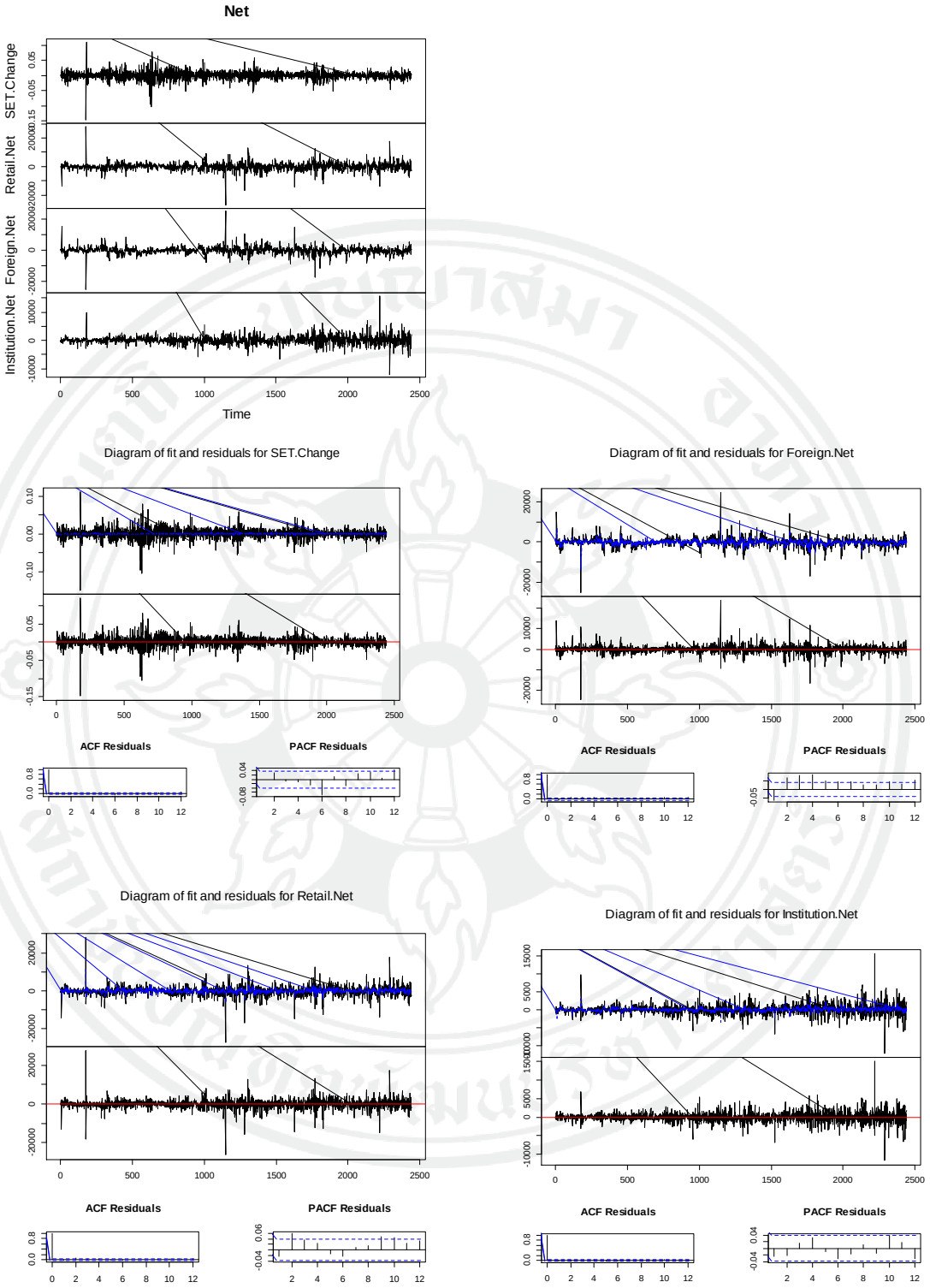

Figure 8 Time Path of the Variables and Diagram of Fit and Residuals from 3/24/06 to 3/23/16 (Net)

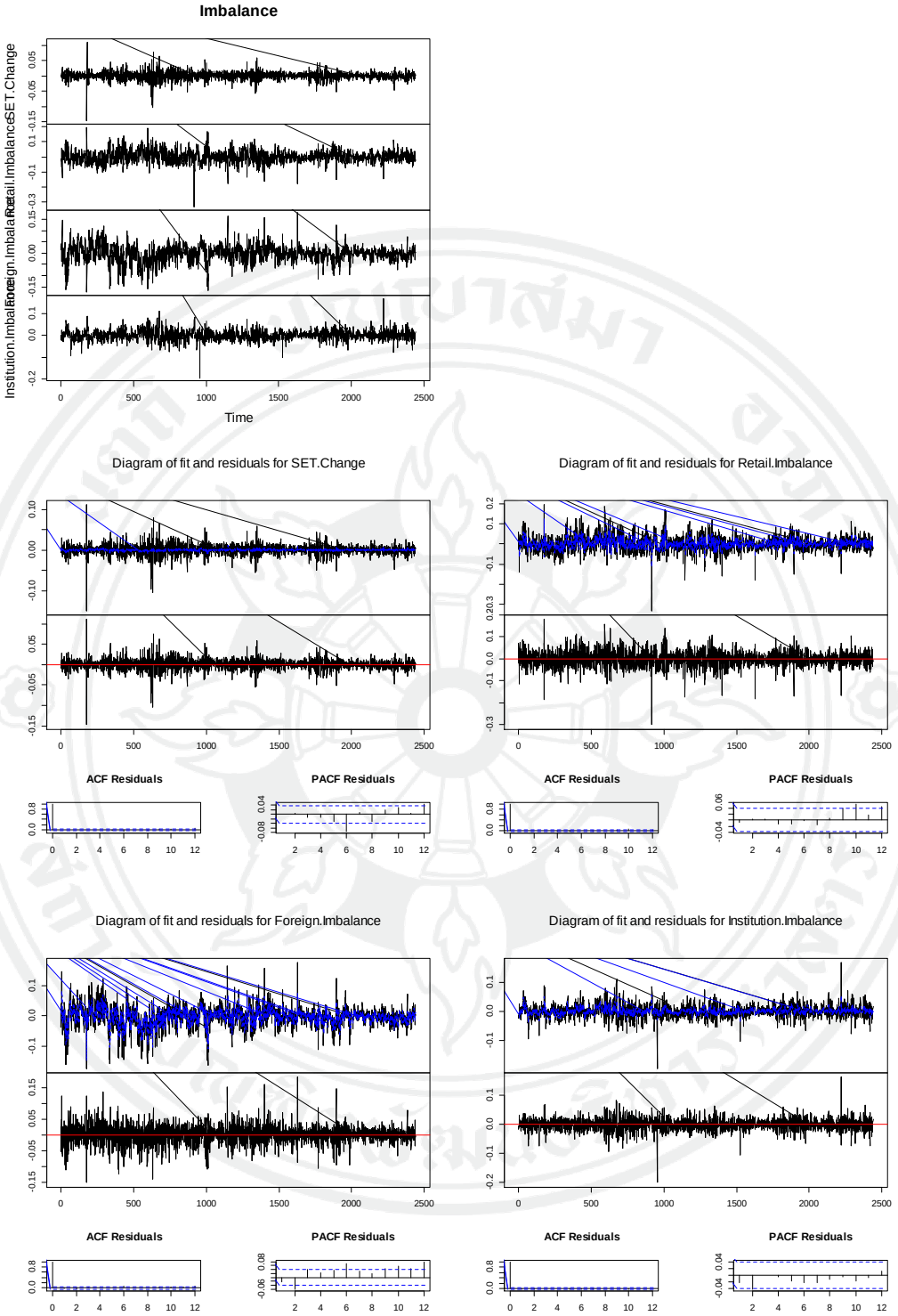

Figure 9 Time Path of the Variables and Diagram of Fit and Residuals from 3/24/06 to 3/23/16 (Imbalance)

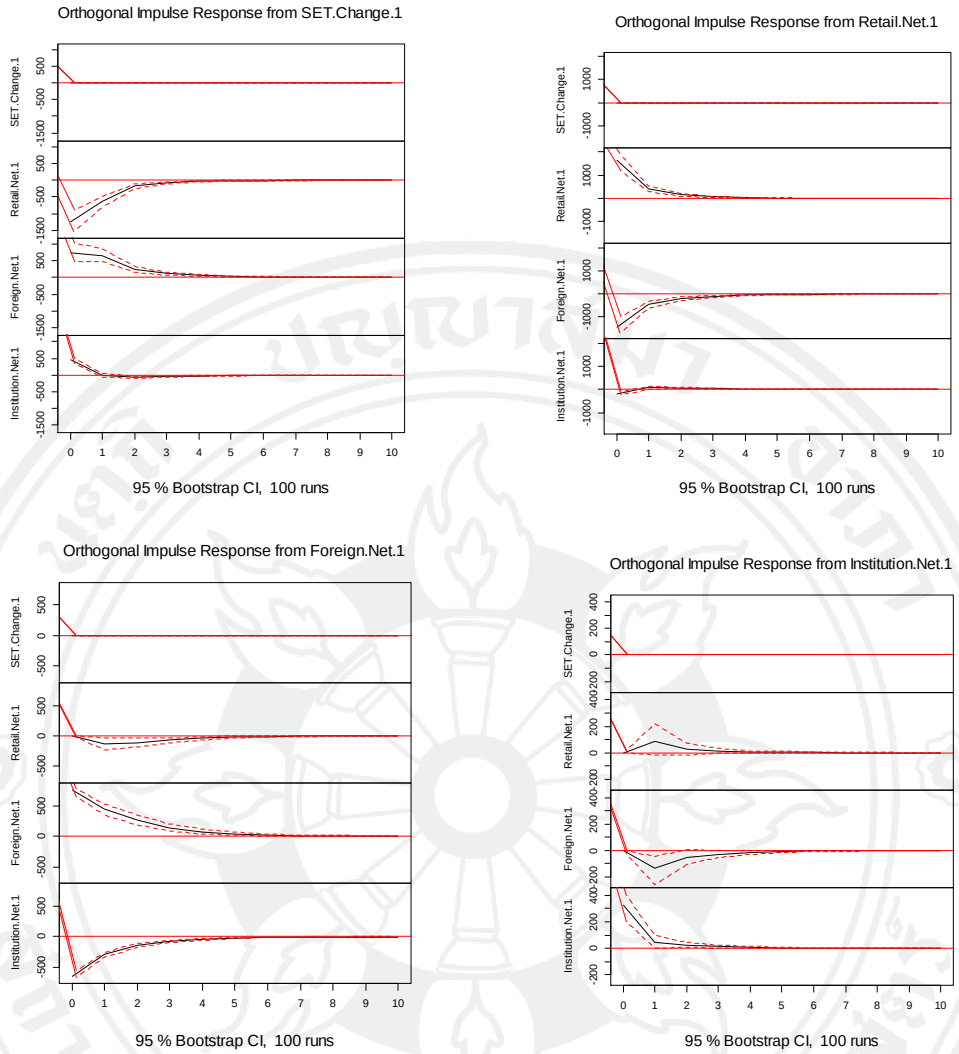

Figure 10 Impulse Response Graphs Net.1

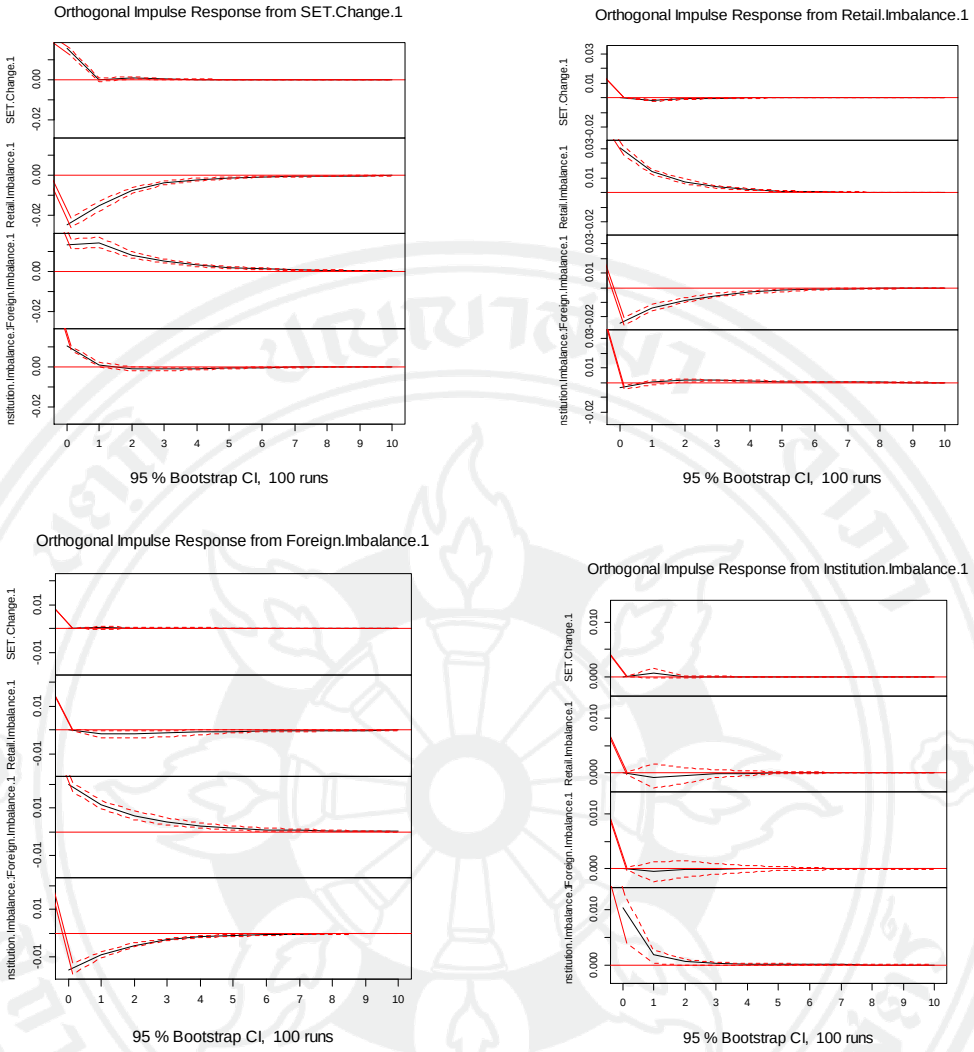

Figure 11 Impulse Response Graphs Imbalance.1

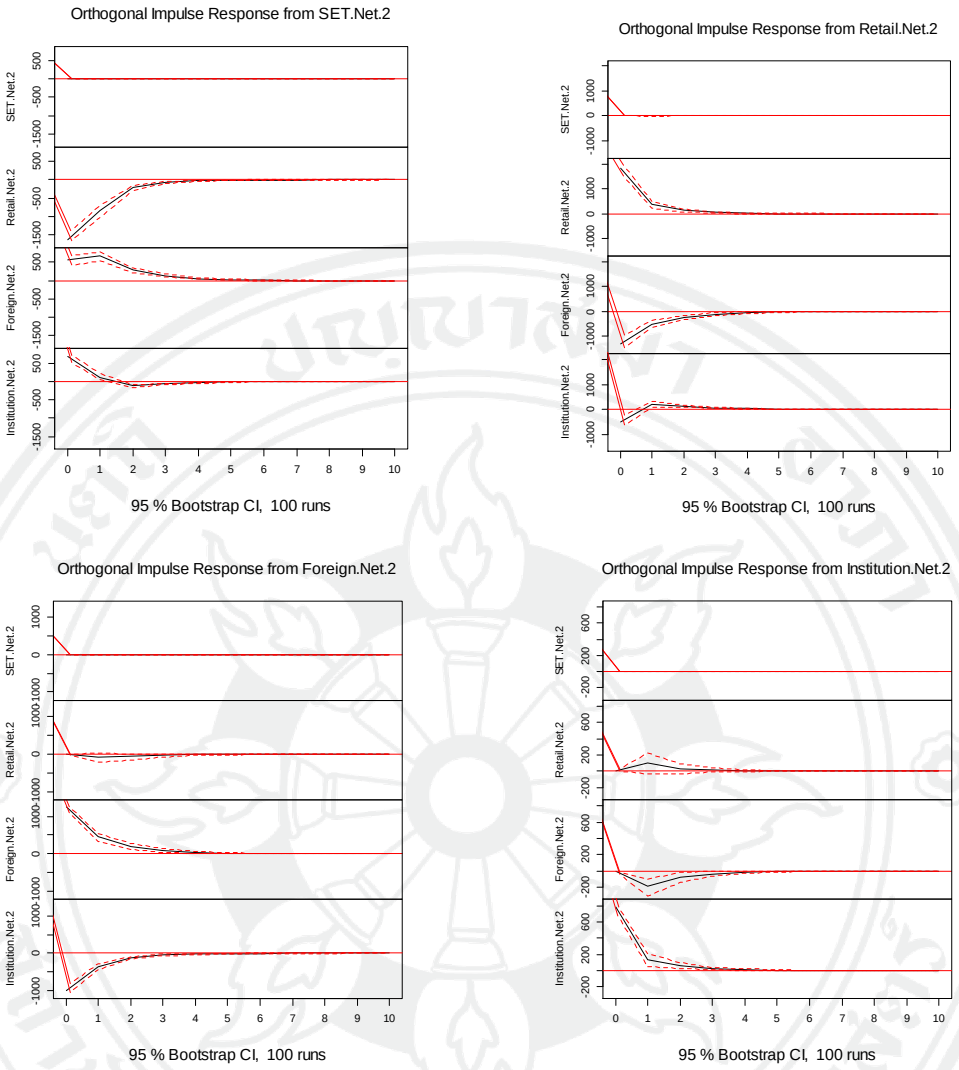

Figure 12 Impulse Response Graphs Net.2

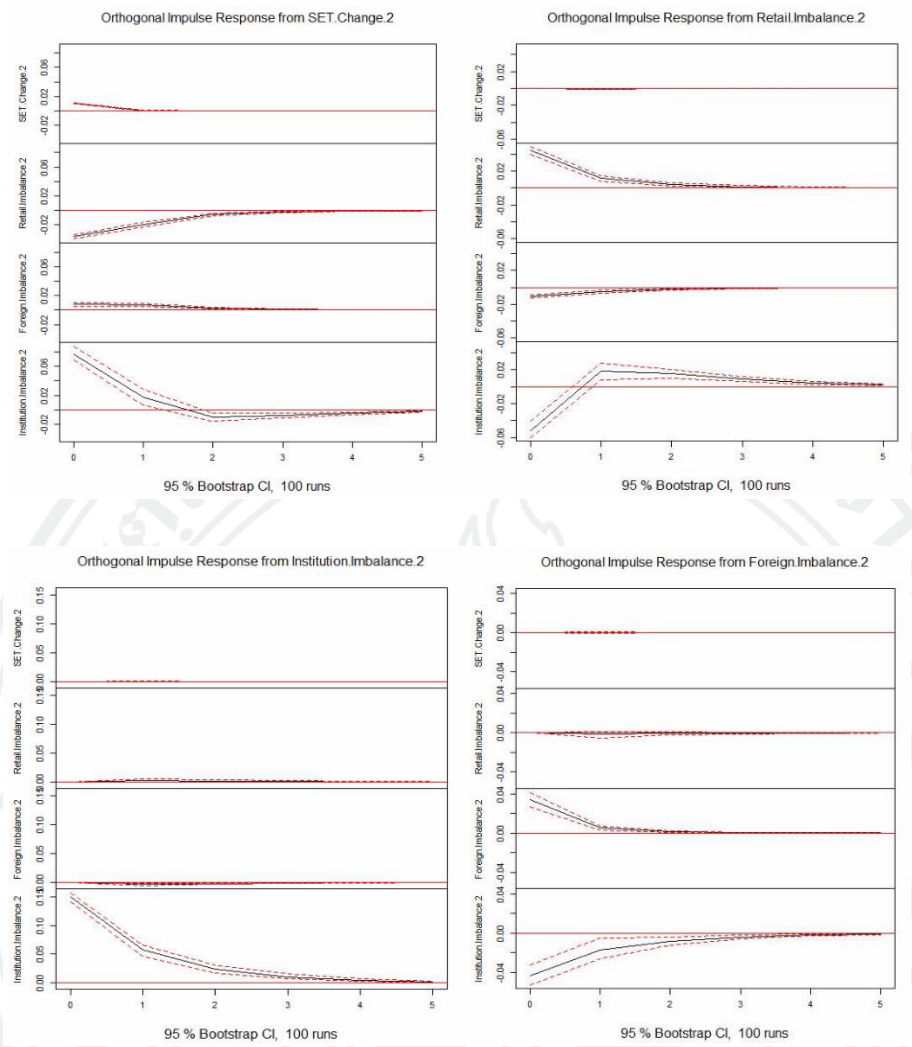

Figure 13 Impulse Response Graphs Imbalance.2

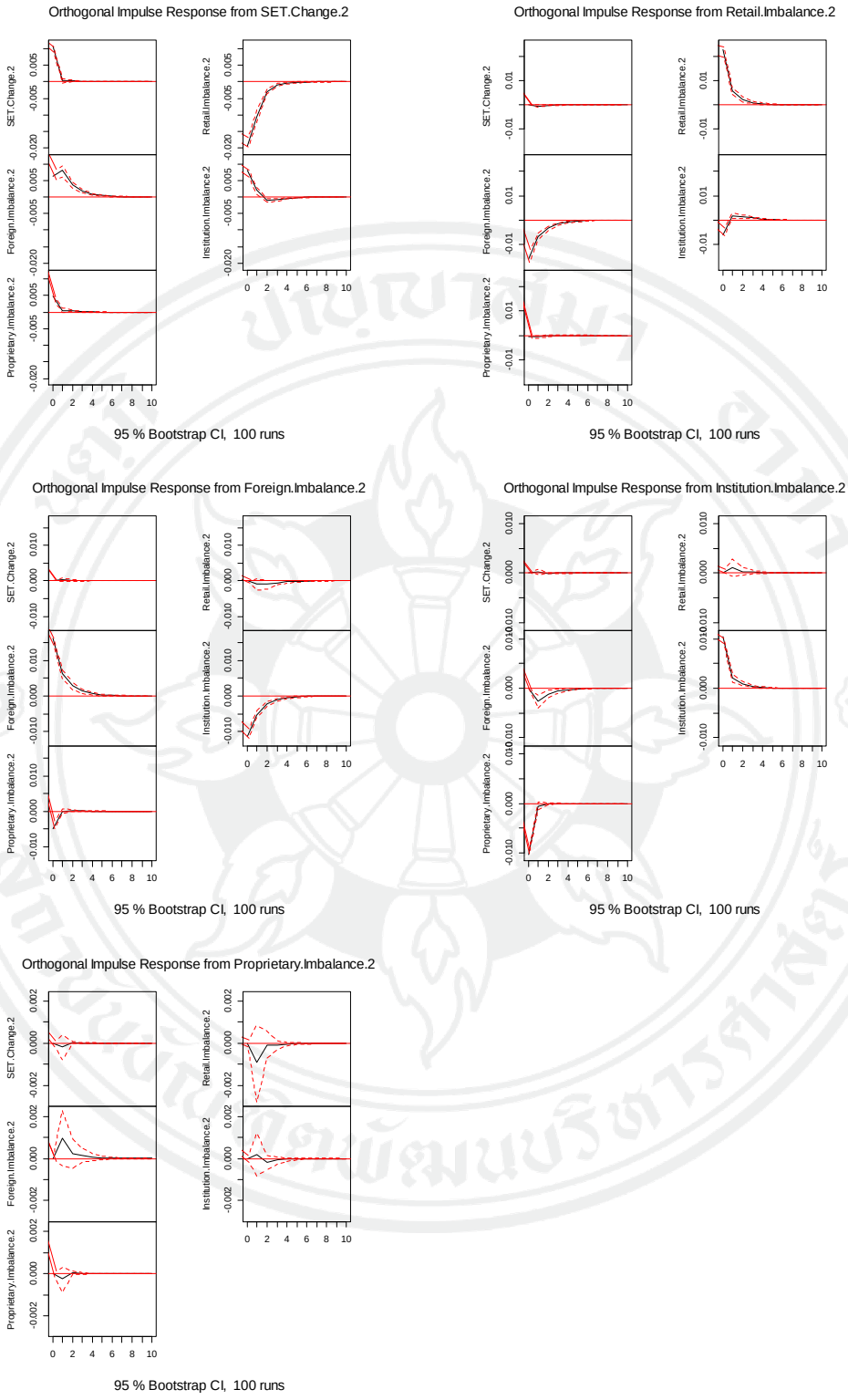

Figure 14 Impulse Response Graphs Imbalance.2, includes Proprietary

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