ความไม่สมมาตรของข้อมูลและโมเมนตัมในประเทศไทย

นายกิตติพงศ์ จงกิตตินฤกร

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาบริหารธุรกิจดุษฎีบัณฑิต
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INFORMATION ASYMMETRY AND MOMENTUM IN THAILAND

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กิตติพงศ์ จงกิตตินฤกร : ความไม่สมมาตรของข้อมูลและโมเมนตัมในประเทศไทย (INFORMATION ASYMMETRY AND MOMENTUM IN THAILAND) อ. ที่ปรึกษาวิทยานิพนธ์หลัก : อ. ดร. สุภารัตน์ ตันทนงศักดิ์กุล, 115 หน้า.

งานวิจัยชิ้นนี้ศึกษาการดำรงอยู่ของโมเมนตัม ปรากฏการณ์โมเมนตัมในช่วงหลายทศวรรษที่ผ่านมาทำให้เกิดข้อสงสัยเกี่ยวกับทฤษฎีตลาดที่มีประสิทธิภาพ (Efficient Market Hypothesis) ยังไม่มีความชัดเจนว่าอะไรคือสาเหตุของโมเมนตัมและใครทำให้เกิด

งานวิจัยชิ้นนี้ศึกษาถึงสาเหตุของโมเมนตัมและใครทำให้เกิด โดยใช้ข้อมูลจากบริษัทที่จดทะเบียนในตลาดหลักทรัพย์แห่งประเทศไทยระหว่างปีพ.ศ. 2542 ถึง 2550 ข้อมูลที่มีลักษณะพิเศษนี้ทำให้เราสามารถศึกษาพฤติกรรมของนักลงทุนแต่ละกลุ่มได้โดยตรงโดยไม่จำเป็นต้องใช้มูลค่าของการซื้อขายในแต่ละครั้งมาเป็นเครื่องบ่งชี้ถึงประเภทของนักลงทุน

ผลการศึกษาพบว่าความไม่สมมาตรของข้อมูล (Information Asymmetry) คือสาเหตุที่ทำให้เกิดโมเมนตัม หุ้นที่มีความไม่สมมาตรของข้อมูลและมีการซื้อขายมากมีโมเมนตัมในผลตอบแทน (Return Momentum) ขณะที่หุ้นที่ความสมมาตรของข้อมูลและมีการซื้อขายมากมีการพลิกกลับในผลตอบแทน (Return Reversal) นักลงทุนต่างชาติและนักลงทุนสถาบันทำให้เกิดโมเมนตัมในราคา (Price Momentum) นักลงทุนต่างชาติเท่านั้นทำให้เกิดโมเมนตัมหลังจากที่มีการประกาศผลการดำเนินงาน (Earnings Momentum)

จากแบบจำลองของหวัง (Wang's (1994) model) นักลงทุนท้องถิ่นรายย่อยมีความรอบรู้มากกว่านักลงทุนต่างชาติและนักลงทุนสถาบัน นักลงทุนที่มีข้อมูลเกี่ยวกับท่องถิ่นมีความรอบรู้ในหุ้นมากกว่านักลงทุนที่มีแค่ความรู้และการจัดการที่ทันสมัย

สาขาวิชา บริหารธุรกิจ ลายมือชื่อนิสิต..... K. Jang

ปีการศึกษา 2553 ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก.....

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KEYWORDS : INFORMATION ASYMMETRY / PRICE MOMENTUM / EARNINGS MOMENTUM / INFORMED TRADING / EARNINGS ANNOUNCEMENT / STOCK EXCHANGE OF THAILAND

KITTIPHONG JONGKITTINARUKORN : INFORMATION ASYMMETRY AND MOMENTUM IN THAILAND. ADVISOR : SUPARATANA TANTHANONGSAKKUN, Ph.D., 115 pp.

This study examines the existences of price and earnings momentum anomalies. The persistence of momentum anomalies over the past few decades raises serious doubts about the efficient market hypothesis. There is no consensus on the sources of these momentum anomalies and who causes them.

This study examines the potential sources of momentums and investigates who causes momentums. This study uses the listed firms on the SET during 1999 to 2007. The unique data set allow us to investigate behaviors of different investor groups, without using trade size as a proxy for investor type.

This study finds that information asymmetry is the source of price momentum. Stocks with high turnover exhibit return momentum under information asymmetry and exhibit return reversal under information symmetry. Foreign investors and local institutional investors cause price momentum. Earnings momentum is caused only by foreign investors.

Under Wang's (1994) model, the local individual investors are informed but the local institutional investors and foreign investor are uninformed. The investors with local knowledge are better informed than investors with more knowledge and sophisticated portfolio management skill.

Field of Study : Business Administration Student's Signature K. Jong.

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Chapter I

Introduction

The persistence of momentum anomalies over the past few decades raises serious doubts about the efficient market hypothesis. Many market anomalies have typically disappeared, reversed or attenuated following their discovery. Yet the momentum anomalies are still robust after their initial discoveries and could not be explained by the three-factor model of Fama and French (1993).

(a) Return momentum

Stock returns based on momentum strategies have been well-known and were well-publicized by at least the early 1990s, but they continue to generate excess profits. Jegadeesh and Titman (1993) first report that short-run momentum strategies from buying past winners and selling past losers produce positive abnormal returns over the following three to twelve month periods after controlling for size and risk. The return momentum is observed not only in the U.S. market but also prevails in other stock markets around the world, see Rouwenhorst (1998) and Griffin, Ji, and Martin (2003).

There is no consensus on the sources of momentums. The financial literature argues that the existences of momentum anomalies are probably related to many sources. Several studies, including Odean (1998) and Grinblatt and Keloharju (2000), documented the disposition effect in many stock markets by. Grinblatt and Han (2005) propose a theory in which momentum is driven by the disposition effect. Zhang (2006) finds that size, analyst coverage, analyst forecast dispersion, and return volatility are related to momentum returns. O'Hara (2003) suggests incorporating informed trading into asset pricing. Hameed, Hong, and Warachka (2008) show the existence of a cross-sectional relationship between informed trading and momentum effect.

Wang (1994) develops a model of competitive stock trading. In this model, investors are heterogeneous in their private information and private investment opportunities. This study

examines the link between the nature of heterogeneity among investors and the behavior of trading volume and its relation to price dynamics. The uninformed investors cannot predict and immediately identify the informed investors. An abnormal trading is caused by public news about the stock's future dividends, under information asymmetry. The abnormal trading volume is larger when the information asymmetry is greater. Hameed, Hong, and Warachka (2008) document that firm-specific informed trading is an important determinant of price momentum. Their findings are consistent with Wang's (1994) model predictions. However, the model does not explicit indicate who are informed investors.

Trading strategies and trading performances for local investors and foreign investors are widely documented in many stock markets. The results vary from markets to markets. Some studies find that foreign investors are more informed because of their superior ability to gather and process new information through sophisticated portfolio management techniques and their worldwide information networks. Because of physical, linguistic, or cultural barriers, others argue that local investors may have informational advantages. However, there is no consensus on who are informed investors.

This study attempts to fill these financial gaps by answering two momentum puzzles. First, we try to investigate what causes return momentum. Several documented causes of momentum, including information asymmetry, uncertainty, liquidity, and disposition effect, are analyzed. Second, we investigate who causes return momentum. This study directly investigates information asymmetry across different investor types using data on SET during 1999 to 2007. The unique SET data provides transactions by different investor groups on an emerging market. Therefore, we do not need to use trade size as a proxy for investor type. While U.K. and U.S. have extensive investor protection laws and strong law enforcement institutions and high stock price informativeness, Thailand has limited investor protection laws, extremely weak law enforcement institutions and low stock price informativeness. Previous studies document a negative relationship between investor protection and information asymmetry. Therefore, information asymmetry and informed trading should be clearer observed in Thailand than in U.K. and U.S. This study uses three different measurements of information asymmetry,

including PIN, AdjPIN developed by Duarte and Young (2009), and Roll's (1987) return volatility ($1-R^2$). Analyst's forecast dispersion and Kyle's lambda are used as proxies for uncertainty and liquidity, respectively.

This study finds a strong cross-sectional relationship between return continuation and informed trading. In particular, stocks with high turnover exhibit return continuation under information asymmetry and exhibit return reversal under information symmetry. The results are consistent with Wang's (1994) predictions. Information asymmetry is the major source of return momentum, not uncertainty, liquidity, or disposition effect. The results show that foreign investors and local institutional investors cause return momentum. Under Wang's (1994) model, the local individual investors are more informed than foreign investors and local institutional investors.

This study contributes to the financial literature by providing clear evidences about return momentum on SET, an emerging market. The source of return momentum is clearly identified on a market with low investor protection. In addition, this study directly investigates the impact of investors trading on return profiles. This information helps us understand who cause momentum effect and who are more informed.

(b) Earnings momentum

Earnings momentum refers to the fact that firms reporting unexpectedly high earnings subsequently outperform firms reporting unexpectedly low earnings. Earnings momentum is relatively short-lived and related to differences in the ability of investors to interpret public information. The financial literature documents that the existences of these anomalies are related to information asymmetry the market.

The abnormal return of firms with positive (negative) earnings surprise continues to drift upward (downward) for several months after the earnings announcements was first documented by Ball and Brown (1968). Since then, many researchers have extensively investigated the post-earnings announcement drift (PEAD) and have confirmed the robustness of PEAD or earnings

momentum. Its persistence violates market efficiency hypothesis. Earnings announcements are a useful context for studying information asymmetry. The informed trading during the following periods will be investigated in this study.

- pre-earnings-announcement period,
- during the earnings-announcement period, and
- post-earnings-announcement period.

It can provide insights as to whether the traders' skill lay in their ability to exploit private or public information.

The PEAD literature documents two different types of earnings surprises:

- random walk-based (RW) earnings surprise
- analyst-based (AF) earnings surprise

There is no consensus regarding the source(s) of these drifts and who cause them. The effects of different investor types on the RW and AF drifts are inconclusive. Recently, Ayers, Li, and Yeung (2009) find that small traders continue to trade in the direction of RW earnings surprises after earnings announcements, whereas large traders continue to trade in the direction of AF earnings surprises. Overall, their findings imply that the RW and AF drifts may be explained by distinct groups of investors that form their earnings expectations differently, who both impact prices and systematically underreact to earnings news.

However, previous researchers classify investors as small or large traders based on trade sizes. They fail to link trade sizes to different investor types. Several studies, including Barclay and Warner (1993), Chakravarty (2001), Campbell, Ramadorai, and Vuolteenaho (2005) point out that small trades could be initiated either by individual investors, or institutional investors who split their trades into smaller trades to reduce price impact. In addition, Campbell et al. (2005) provide evidences that institutions tend to make both very large and very small trades, with individuals tending to make intermediate-sized trades. In sum, these studies imply that trade sizes could be poor proxies for different investor groups.

This study extends Ayers, Li, and Yeung's (2009) study to investigate informed trading around earnings announcement, in two different dimensions:

- Utilizing the unique data set from the Stock Exchange of Thailand (SET). Without using trade sizes as proxies, this study will directly investigate which groups of investors cause earnings momentum effect.
- Investigating trading around earnings announcement period. It will reveal who are better informed and trading to take advantage of their private information.

This study uses the unique data from the Stock Exchange of Thailand (SET) to investigate the differences in information asymmetry across different types of investors, including retail customers, foreign investors, institutional investors and broker owned portfolio. The SET provides a unique opportunity to directly investigate the potential of different trading behaviors of diverse investor groups. Early studies by Easley and O'Hara (1987) and Lee (1992) use the trade sizes as a proxy for investor types. Instead of using a proxy, this actual data set allows us to study whether retail customers, institutional investors, broker owned portfolio, or foreign investors are better informed in the SET. While U.K. and U.S. have extensive investor protection laws and strong law enforcement institutions and high stock price informativeness, Thailand has limited investor protection laws, extremely weak law enforcement institutions and low stock price informativeness. Previous studies document a negative relationship between investor protection and information asymmetry. Therefore, information asymmetry and informed trading should be clearer observed in Thailand than in U.K. and U.S.

This study finds no investor group has private information prior to the earnings announcement. There is no clear trading pattern from any investor groups. During the post-earnings announcement period, cumulative abnormal return (CAR) is caused by foreign investors. The post-earnings announcement drifts are associated with analyst-based (AF) earnings surprises, not random walk-based (RW) earnings surprise.

This research contributes to the financial literature by directly linking post-earnings-announcement period trading by distinct groups of investors to the seasonal random walk-

based and analyst-based drifts. In addition, this study will also investigate who are better informed prior to earnings announcement by investigating investors' trading activities. Finally, this study tries to answer the question "Who cause the post-earnings-announcement drift?".

The remainder of the paper is organized as follows. Chapter II outlines the related literature. Chapter III overviews the research hypothesis. Chapter IV presents the data used in this study. Chapter v lays out the methodology of the research. Chapter VI presents the results and discussions. Finally, chapter VII summarizes the results of this study.

Chapter II

Literature Review

2.1. Introduction to momentum

Fama (1997) argues that market efficiency hypothesis survives the challenge from the literature on long-term return anomalies. Most of the anomalies are chance results, which are consistent with the market efficiency hypothesis. The following premier momentum anomalies are exception and are left unexplained by the three-factor model of Fama and French (1993).

(a) Price momentum

Price momentum was documented by Jegadeesh and Titman (1993). It refers to the fact that stocks with high returns over the last year tend to have high returns for the next few months and stocks with low past returns tend to have low future returns. Many market anomalies have typically disappeared, reversed or attenuated following their discovery. The earnings momentum is still robust after its initial discovery.

Price momentum is relatively short-lived and related to differences in the ability of investors to interpret public information. Chan (2003) shows that price momentum anomaly is concentrated in stocks about which new public information has been released, but earnings momentum anomaly can be interpreted as investors' reactions to public earnings news. Sadka (2005) finds that unexpected systematic (market-wide) variations of the variable component rather than the fixed component of liquidity are shown to be priced within the context of price momentum and earning momentum. He interprets a substantial part of these anomalies as a compensation for the unexpected variations in the aggregate ratio of informed traders to noise traders since the variable component is typically associated with private information (Kyle, 1985). The returns of these anomalies would be related to the amount of information asymmetry in the market. Therefore, these momentum anomalies provide a natural testing ground for the importance of information asymmetry.

Stock return or earnings based momentum strategies have been well-known and were well-publicized by at least the early 1990s. Jegadeesh and Titman (1993) first report that short-run momentum strategies from buying past winners and selling past losers produce positive abnormal returns over the following three to twelve month periods after controlling for size and risk. Chan, Jegadeesh and Lakonishok (1996) show that the probable source of profitability of momentum strategies is a delayed price reaction to firm specific information, such as news announcement. In their study, the drift in future returns could not be explained by risk, size, and book-to-market effects. The short-term momentum is observed not only in the U.S. market but also prevails in other developed stock markets around the world, as documented by Rouwenhorst (1998) and Griffin, Ji, and Martin (2003). Jegadeesh and Titman (2001) show that momentum strategies are profitable in the nineties as well. Despite the popularity of momentum strategies in the investment community and its visibility in the academic community, there is no evidence of the effect disappearing.

The return profiles can be classified into three periods:

- short-term reversal (less than 1 month),
- intermediate-term momentum (from 3 months to 1 year), and
- long-term reversal (from 3 to 5 years).

Jagadeesh (1990), Lehmann (1990), and Gutierrez and Kelley (2008) document that stock return reversals at weekly and monthly intervals. For intermediate-term momentum, Jegadeesh and Titman (1993) find that a strategy that buys past six-month winners and shorts past six-month losers earns approximately one percent per month over the subsequent six months. For long-term reversal, Thaler and De Bondt (1985 and 1987) and Lakonishok, Shliefer and Vishny (1994), Jegadeesh and Titman (2001) showed that past losers outperform past winners or vice versa over the subsequent three to five years not only in US markets but also in other stock markets. Griffin, Ji and Martin (2003) find that momentum profits reverse over a one to five year horizon for many international markets.

Financial academics have long recognized that stock returns appear to exhibit continuation, or momentum. However, there is little agreement about an explanation for this

phenomenon. It is very unlikely that it can be explained by risk. Financial economists are far from reaching a consensus on what generates momentum profits.

By taking advantage of underreaction or overreaction without bearing extra risk, abnormal returns provided by momentum and contrarian strategies presents a challenge to the efficient markets hypothesis. Financial market anomalies related to profit opportunities typically disappear, reverse, or attenuate following their discovery. Momentum is an exception. Momentum profitability is the only CAPM-related anomaly unexplained by the Fama and French (1993) three-factor model. Fama and French (1996) show that long-term reversals can be consistent with a multifactor model of returns, but their model fails to explain medium-term performance continuation.

(b) Earnings momentum

Earnings momentum documented by Ball and Brown (1968). It refers to the fact that firms reporting unexpectedly high earnings subsequently outperform firms reporting unexpectedly low earnings. Prices continue to move up after positive earnings surprises and down after negative earnings surprises. The post-earnings-announcement drift (PEAD) is one of the longest-standing anomalies. Many market anomalies have typically disappeared, reversed or attenuated following their discovery. The earnings momentum is still robust after its initial discovery.

Earnings momentum is relatively short-lived and related to differences in the ability of investors to interpret public information. Sadka (2006) finds that unexpected systematic (market-wide) variations of the variable component rather than the fixed component of liquidity are shown to be priced within the context of price momentum and earning momentum. He interprets a substantial part of these anomalies as a compensation for the unexpected variations in the aggregate ratio of informed traders to noise traders since the variable component is typically associated with private information (Kyle, 1985). The returns of these anomalies would be related to the amount of information asymmetry in the market. Therefore, these momentum anomalies provide a natural testing ground for the importance of information asymmetry.

The abnormal return of firms with positive (negative) earnings surprise continues to drift upward (downward) for several months after the earnings announcements was first documented by Ball and Brown (1968). Since then, many researchers have extensively investigated the post-earnings announcement drift (PEAD) and have confirmed the robustness of PEAD or earnings momentum using more recent data (Foster, Olsen and Shevlin, 1984 and Bernard and Thomas, 1990) and using data from non-US stock markets (Hew, Skerratt, and Strong and Walker, 1996). Chordia and Shivakumar (2005) document that a portfolio that is long in stocks with the highest earnings surprises and short in stocks with the lowest earnings surprises provides a return of 90 basis points per month or over 10% annually. Such large profits, from a simple long-short trading strategy, over a period of almost four decades point to a violation of the weak-form market efficiency as defined by Fama (1970).

Prior researches demonstrate that earnings announcements contain important information about future earnings. The market captures most of this information during the following three periods:

- pre-earnings-announcement period (Ball and Brown, 1968),
- during the earnings-announcement period (Beaver, 1968, Easton and Zmijewski, 1989), and
- post-earnings-announcement period (Bernard and Thomas, 1989 and 1990, Abarbanell and Shane and Brous, 2001).

Earnings announcements are a useful context for studying information asymmetry. Focusing on trading around these events mitigates the joint-hypothesis problem since measurements of stock selection ability in the short period around earnings announcements are relatively insensitive to the risk-adjusted model. In addition, the study could be able to distinguish between pre- and post-announcement trading. It can provide insights as to whether the traders' skill lay in their ability to exploit private or public information.

2.2. Sources of Momentum

(a) Uncertainty

The literature documents the contribution of uncertainty to momentum returns. The argument is that limits to arbitrage, which are the corner stone for behavioral finance, are more severe in stocks with higher cash-flow uncertainty. Zhang (2006) interprets these associations as evidence that behavioral biases influence stock prices. Several firm characteristics are used as proxies for uncertainty including:

- firm's size,
- analyst coverage, which equals the number of analysts covering a stock each month,
- analyst forecast dispersion, which is defined as the monthly standard deviation of analysts' earnings forecasts for the next fiscal year divided by the stock price, and
- idiosyncratic volatility, which is estimated from a stock's return ($1-R^2$) by regressing its weekly return on the return of its industry and the market.

Uncertainties in future cashflows and momentum returns are negatively related to size and analyst coverage, but are positively related to analyst forecast dispersion and idiosyncratic volatility.

Jiang, Lee, and Zhang (2005) examine the role of information uncertainty in predicting cross-sectional stock returns. They define information uncertainty in terms of "value ambiguity," or the precision with which firm value can be estimated by knowledgeable investors at reasonable cost. This study shows that:

- firms with high information uncertainty earn lower future returns, and
- price and earnings momentum effects are much stronger among firms with high information uncertainty.

The evidence indicates that high information uncertainty exacerbates investor overconfidence and limits rational arbitrage. Recently, Zhang (2006) investigates the role of information uncertainty in price continuation anomalies and cross-sectional variations in stock returns. This study observes greater price drift when there is greater information uncertainty and attribute the

short-term price continuation to behavioral biases. As a result, greater information uncertainty produces relatively higher expected returns following good news and relatively lower expected returns following bad news.

(b) Liquidity

Liquidity, denoting the ability to trade large quantities quickly, at low cost, and low price impacts, is a broad and elusive concept. The time-series relationship between the expected stock returns and their liquidity is widely documented in the literature. Most of the previous studies focus on the level of liquidity as a characteristic of a stock. Liquidity is proxied by bid-ask spread (Amihud and Mendelson, 1986), price impacts (Brennan and Subrahmanyam, 1996), volume and turn over (Chordia, Subrahmanyam, and Anshuman, 2000), and the probability of information-based trade (PIN) (Easley, Hvidjaker, and O'Hara, 2002).

Focusing on an aspect of liquidity associated with temporary price fluctuations induced by order flow, P´astor and Stambaugh (2003) investigates whether market-wide liquidity is a state variable important for asset pricing. They develop a measure of aggregate (market-wide) liquidity based on daily price reversals. Their monthly liquidity measure, an average of individual-stock measures estimated with daily data, relies on the principle that order flow induces greater return reversals when liquidity is lower. This study finds that systematic liquidity fluctuations cause variation in momentum returns and that systematic liquidity risk is a priced risk factor.

Using Amihud's (2002) liquidity measure, Acharya and Pedersen (2004) identifies the component of liquidity risk that is related to existing asset-pricing anomalies. They show that expected stock returns are a function of expected stock illiquidity and covariances between stock return, stock illiquidity, market return, and market illiquidity.

Recently, Sadka (2005) investigates whether the components of liquidity risk are important for asset-pricing anomalies. Based on the empirical market microstructure model of Glosten and Harris (1988), he defines the liquidity as the price-impact induced by trades, and

separates liquidity into fixed and variable components. The unexpected systematic (market-wide) variations of the variable component are shown to be priced within the context of momentum, not the fixed component of liquidity. This variable component is usually associated with private information. Then, he concludes that compensation for the unexpected variations in the aggregate ratio of informed traders to noise traders creates momentum.

(c) Transaction costs

Momentum and PEAD returns are relatively short-lived. Implementing momentum and PEAD trading strategies probably involves high turnover and high transactions costs. Trading costs include:

- direct trading costs include bid-ask spreads and commissions,
- indirect trading costs include price pressure of large trade quantities and delay in executing an entire order (Kyle, 1985 and Bhushan, 1994).

Bhushan (1994) finds that the magnitude of PEAD is positively related to direct and indirect trading costs. Ke and Ramalingegowda (2005) document that transient institutions exploit PEAD more aggressively in firms with low transaction costs. Chordia, Goyal, Sadka, Sadka and Shivakumar (2006) find that the PEAD occurs mainly in the highly illiquid stocks which have high trading costs and market impact costs. However, recently, Aboody, Lehavy, and Trueman (2008) find that stocks with the strongest prior 12-month returns experience a significant average market-adjusted return of 1.58% during the five trading days before their earnings announcements and a significant average market-adjusted return of -1.86% in the five trading days afterward. These returns remain significant even after accounting for transactions costs.

(d) Order flow imbalance

The relationship between stock returns and trading volume is studied by several researchers including Karpoff (1987), Gallant et al. (1992), Hiemstra and Jones (1994), and Lo and Wang, (2000). However, trading volume can be caused by buyer-initiated or seller-initiated trades. In addition, a large amount of trading interest on a given day, which is fairly evenly distributed between buyers and sellers, can also affect the trading volume. Order imbalances have greater explaining power beyond volume in explaining stock returns. Since order

imbalances can signal excessive a stock's demand or supply, then they can cause future returns. In addition, a high absolute order imbalance can affect returns as market makers struggle to re-adjust their inventory.

The previous studies on order flow imbalance focus on over short time horizon or for specific agents (Lee, 1992, Lakonishok et al., 1992, Lauterbach and Ben-Zion, 1993, Sias, 1997, Wermers, 1999, Cushing and Madhavan, 2000 and Stoll, 2000). Focusing on the long-term order imbalances, Chordiaa and Subrahmanyam (2004) shed light on the role of inventory effects in daily stock price movements. They investigate the relation between daily returns of individual stocks and order imbalances. Overall, their empirical findings are consistent with a model of market equilibrium in which market makers with inventory concerns accommodate positively autocorrelated imbalances. Autocorrelated imbalances generate price pressures which attribute to the relation between returns and lagged imbalances. In addition, the imbalance-based trading strategies yield statistically significant returns.

(e) Underreaction

The PEAD has been robust over almost four decades and is commonly interpreted as evidence that investors underreact to earnings surprises. This follows empirical evidences that good-news firms, i.e. those with high standardized-unexpected earnings (SUE), outperform bad-news (low-SUE) firms. The results suggest that investors underreact to the information content of earnings, thereby generating return continuation. Daniel, Hirshleifer, and Subrahmanyam (1998) show that investors do not sufficiently react to public signals when the content of the new information conflicts with their private signals. Barberis, Shleifer and Vishny (1998) attribute underreaction to earnings announcements to investors' conservatism. Individual investors reluctance to update their beliefs upon receiving new information and disregard the full information content of an earnings announcement. Rather than using the new information contained in the earnings announcement, they tend to rely on their prior estimates of earnings. In Hong and Stein's (1999) model, investors make forecast based on their private information but do not condition their estimates on full price history. It generates underreaction to public information.

2.3. Wang (1994)'s price discovery model

Wang (1994) develops a model of competitive stock trading. In this model, investors are heterogeneous in their:

- private information and
- private investment opportunities

They rationally trade for both informational and non-informational motives. These distinct motives yield different return dynamics. This study examines the link between the nature of heterogeneity among investors and the behavior of trading volume and its relation to price dynamics.

Since investors are different, they trade competitively among themselves. Informed investors trade when:

- they have private information about the stock's future dividends. It leads to informed trading.
- their investment opportunities change. It leads to unformed trading.

The uninformed investors trade only for non-informational reasons. They cannot predict and immediately identify the informed investors' trading motives. Then, they rationally extract information from realized dividends, prices, and public signals. Regarding the extent to which private information is responsible for turnover, the uninformed investors continue to learn to correct their initial assessments. Trading against informed investors' private information, they, therefore, face the risk of the adverse selection problem. In order to cover the risk, they require a higher discount in price, as information asymmetry increases.

Based on this model, abnormal trading is caused by public news about the stock's future dividends, under information asymmetry. Difference in investors' responses to the same public information creates trading. The abnormal trading volume is larger when the information asymmetry is greater. This model has the following predictions:

- With private information, the stocks with high turnover exhibit return continuation. Under the learning process, uninformed investors gradually update their cash-flow

expectations and imitate the informed investors' trading strategy. Their learning process and trading behavior cause return continuation.

- Without private information, the stocks with high turnover exhibit return reversals.

The uninformed investors' risk premium for the provision of liquidity causes these temporary price impacts. Return continuation in this model requires information asymmetry since risk premium alone is insufficient to create return continuation.

2.4. Momentum and informed trading

O'Hara (2003) argues that anomalies such as momentum highlight the need to incorporate informed trading into asset pricing. Several researchers document the association between informed trading and momentum. Odders-White and Ready (2005) find that firms with lower credit ratings have more informed trading. Intuitively, firms with lower credit ratings are likely to be closely monitored by debtholders, customers, suppliers, and other stakeholders are willing to trade on their private information. Avramov, Chordia, Jostova, and Philipov (2007) find stronger momentum in stocks with lower credit ratings. These two previous studies suggest that informed trading can explain the momentum effect in stocks with lower credit ratings. Llorente, Michaely, Saar, and Wang (2002) examine the dynamic relation between return and volume of individual stocks. In their study, investors trade to share risk or speculate on private information. By analyzing the relation between daily volume and first-order return autocorrelation for individual stocks, they show that speculative trades lead to return momentum while risk-sharing trades leads to return reversal. They attribute the cross-sectional variation in the relation between volumes and return autocorrelation to the informed trading. Liang's (2006) results confirm that stocks with higher PIN measures exhibit stronger momentum across the strategies in Jegadeesh and Titman (1993). Instead of imitating the informed traders' prior trades, uninformed investors trade against informed investors. This study does not take into account the interaction between informed trading and turnover.

Recently, Hameed, Hong, and Warachka (2008) investigate Wang (1994)'s price discovery model with heterogeneous investors and asymmetric information. To study the

momentum effect in individual stocks, they use the probability of informed trading (PIN) in Easley, Hvidkjaer, and O'Hara (2002) as a proxy for asymmetric information. The firm-specific interaction variable, defined by product of PIN and past returns over the intermediate horizon, can predict the future returns and eliminate the predictability of the past intermediate returns. This study shows the existence of a cross-sectional relationship between informed trading and momentum effect. In particular, while the high turnover stocks with low information asymmetry exhibit return reversal, the high turnover stocks with high information asymmetry exhibit return continuation. This relationship is not attributable to cross-sectional differences in:

- uncertainty; proxied by size, analyst coverage, analyst forecast dispersion, and idiosyncratic volatility,
- liquidity; proxied by effective spreads and Kyle (1985)'s lambda, and
- order flow imbalances.

The positive relationship between information asymmetry and momentum is compatible with informed trading being the origin of return continuation. The evidence emphasizes the role of price discovery in generating short-term price momentum. Their evidences imply that short-term price momentum is not caused by an overreaction to private information. Through the learning process, uninformed investors update their cash-flow expectation, imitate the previous informed investors' trades, and gradually become informed. Their learning creates return continuation. However, using probability of informed trading (PIN) as a measure of information asymmetry in the previous studies yields questionable results. Several researchers challenge whether PIN is priced because of information asymmetry or illiquidity. In addition, the previous studies do not investigate who are better informed and whether Wang's (1994) predictions hold across different types of investors, i.e., with private information, whose turnovers cause return continuation and without private information, whose turnovers cause return reversal.

2.5. Investors' trading strategies

Different trading strategies and performances across different investor types in the US are substantially documented in the literature. Barber and Odean (2000) and Griffin, Harris, and Topaloglu (2003) document that individual investors tend to follow contrarian strategy, holding

stocks with underperformance and selling stocks with over performance. Based on survey data by small individual investors over 1987-1994, Bange (2000), however, shows that individuals are positive feedback traders, increasing equity holdings after market run-ups and decreasing their holdings after market downturns. They are likely to realize winners than losers, known as disposition effect (see Shefrin and Statman, 1985 and Odean, 1998). Several researchers, including Jegadeesh and Titman (1993), Grinblatt, Titman, and Wermers (1995), Bohn and Tesar (1996), Chan, Jegadeesh, and Lakonishok (1996), Rouwenhorst (1998), Nofsinger and Sias (1999), Badrinath and Wahal (2002), Griffin, Harris, and Topaloglu (2003), document that institutional investors tend to follow momentum strategy, buy past winners and selling past losers. Grinblatt, Titman and Wermers (1995) find that the momentum strategy is more effective than the contrarian strategy. Nofsinger and Sias (1999) show that there exists a strong positive relations between institutional trading and subsequent returns by which the stocks with net institutional buy outperform the stocks with net institutional sell. They find no return reversals (no overreaction) within up to two years after institutional trading. Badrinath and Wahal (2002) find that institutional investors tend to follow momentum strategy when they purchase but follow contrarian strategy when they dispose of their holding positions. The momentum trading does not generate excess returns since trading behavior and cycles vary across different types of institutions.

Outside the US, different trading strategies between local investors and foreign investors are widely documented. A substantial influence on both individual stock prices and overall market movements by foreigners' trading along with their increasing ownership are widely recognized. Choe, Kho, and Stulz (1999) using the Korean stock market, Grinblatt and Keloharju (2000) using Finland stock market, and Richards (2005) using six Asian emerging markets, find that foreign investors adopted positive feedback trading strategy. Froot, O'Connell, and Seasholes (2001) find evidence of positive feedback trading by foreign investors in 44 countries over the period 1994-1998. They show that fund inflows have positive forecasting power for future equity returns, especially in the emerging markets. Recently, Bae and Min (2007) find that foreigners behave like positive feedback traders in the Korean stock market. Foreigners tend to buy stocks that have outperformed previously and sell stocks that have underperformed,

suggesting that foreigners behave like short-term momentum traders pursuing a growth strategy. The stocks foreigners buy significantly outperform the stocks they sell in terms of both stock's returns and operating profitability, leading to the significant outperformance of foreigners' trading strategies over those of local institutions and individual investors. Overall, the literature consistently supports that foreign investors following momentum trading strategy.

The existing literature, including Grinblatt and Keloharju (2000) using Finland data, Froot, O'Connell, and Seasholes (2001) using data from 44 countries, Jackson (2003) using Australian data, and Richards (2005) using data from six Asian markets, shows that individual investors following contrarian strategy. Choe, Kho, and Stulz (1999) find evidence individual investors in Korea traded like contrarians by buying more of the stocks that have performed poorly. Using data from Korean stock market, Bae and Min (2007) find that local institutional investors show a tendency to buy more of stocks that have risen in price but individual investors trade like contrarians; they tend to buy the past losers and sell the past winners. Overall, the literature consistently supports that local individual investors following contrarian trading strategy.

2.6. Investors' informativeness

Early studies assume that institution investors have informational advantages and make large trades. Institutional investors with more resources are more efficient analyzing data. Because of the costly information collection and processing, individual traders with limited resources are likely to be uninformed noise traders. Grossman and Stiglitz (1980), Kothre and Laux (1995), Sarin, Shastri and Shastri (2000), and Heflin and Shaw (2000) find the positive relationship between information asymmetry and institutional ownership. The focuses of the research is shift to study the informativeness of individual domestic investor and foreign investors, as more information on different trader types is available. The empirical evidences provide mixed results on the informativeness for different trader types. The variations in the results are probably due to differences in:

- periods of the study,

- methods of the study,
- data set.

Foreign investors are assumed to be winners over individual local investors because of their superior ability to gather and process new information through sophisticated portfolio management techniques and their worldwide information networks. Early studies by Seasholes (2000) using Taiwanese data, Grinblatt and Keloharju (2000) using Finnish data, and Froot and Ramadorai (2001) using a cross section of 25 countries make a convincing case that foreigners do better than local investors. They attribute the better foreigner investors' informativeness to better company investment experience and resources. In addition, Richards, (2004) analyses data for the aggregate daily trading of all foreign investors in six Asian emerging equity markets. The results suggest that foreign investors and external conditions have a larger effect on emerging markets than implied by previous work. Recently, Bae and Min (2007) examine the trading behavior and portfolio performance of foreigners, local institutions, and individual investors in the Korean stock market. They find that the foreigners' buying stocks significantly outperform the foreigners' selling stocks in terms of stock's returns and operating profitability, leading to the significant outperformance of foreigners' trading strategy over those of local institutions and individual investors. They attribute the superior performance of foreign investors to the ability to discern company stocks with, at least short-term, good versus not-so-good prospects.

Regardless of their lacking of modern asset management techniques, experienced stock analysts, and inferior information processing, local investors may have informational advantages because of physical, linguistic, or cultural barriers, as documented by several studies. Hau (2001), using German Security Exchange data, explores informational asymmetries across the traders and find evidence for an information advantage due to corporate headquarters proximity for high-frequency (intraday) trading. Choe, Kho, and Stulz (2004), using Korean data, show that domestic individual investors have an edge over foreign investors. The prices move more against foreign investors than against domestic investors before trades. Using transaction data from Indonesia, Dvorak (2005) shows that domestic investors have

higher profits than foreign investors. Chan, Menkveld, and Yang (2006) uses the perfect market segmentation setting in China's stock market and find that foreign investors are at informational disadvantage relative to domestic investors. Domestic investors lead foreign investors in price discovery. Bae, Stulz, and Tan (2007), using a sample of 32 countries, find that there is an economically and statistically significant of analyst local advantages. The local advantages are high in countries with smooth earnings, less information disclosure, and weak relationship between firm idiosyncratic information and stock returns. The local advantages are also negatively related to whether a firm has foreign assets, to market participation by foreign investors and by institution investors and it is positively related to holdings by insiders. There is a positive correlation between the extent to which U.S. investors underweight a country's stocks and that country's analyst local advantage.

Kang and Stulz (1997) studies stock ownership in Japanese firms by non-Japanese investors from 1975 to 1991. They document that foreign investors overweight shares of firms in manufacturing industries, large firms, firms with good accounting performance, firms with low unsystematic risk, and firms with high leverage and find no difference in the performance of domestic and foreign investors.

Recently, few studies using a unique data from Thailand find that foreign investors are better informed. Wang (2006) documents a strong contemporaneous relationship between foreign equity trading and market volatility in Thailand. Although foreign selling accounts for only a small portion of daily trading, it has the highest explanatory power for market volatility in both countries. Trading within foreign and local investor groups is often negatively related to volatility. The findings are robust to different sub-periods and different measures for volatility and trading activities. Janyangyuen (2008) shows that the foreign investors are indeed informed traders and contribute to the price discovery as measured by information share. The foreign investors account for a majority of price discovery in spite of less number of deal volume and deal value traded. The information share estimates for foreign investors range from 30 percent to 68 percent which is higher than the information share of the local customers. Foreign investors are the major contributors to the price discovery of the share and are considered more informed

traders. His finding supports previous literature which endorses the better information that foreign investors possess.

2.7. Investors Trading Around Earnings Announcement Date

(a) Pre-Earnings-Announcement Period

Stock market reactions and trading volumes change significantly the day prior to and the day of quarterly earnings announcements in the Wall Street Journal. Some trades are initiated by informed investors who could acquire private information before the news release. Therefore, information asymmetry is likely to increase before the day of news releases. Bernard and Thomas (1990) document that the pattern of previous earnings changes can explain a significant portion of the variation in returns around earnings announcement. Lee (1992) beliefs that investors possessing information regarding future price movements in a stock will most likely be the trade initiators. Graves, Jennings, and Mendenhall (1995) find that some investors with large trades successfully predict both positive and negative earnings surprises and some investors with small trades have no ability to predict good-news earnings announcement.

In general, the literature that considers trading by institutional investors during pre-earnings announcements has produced mixed findings. Using quarterly data, Ali, Durtschi, Lev and Trombley (2004) find that institutions have superior information about forthcoming earnings announcements. Berkman and McKenzie (2009) find that pre-announcement changes in institutional holdings have significant explanatory power with respect to the upcoming earnings announcement. In contrast, Griffin, Shu and Topaloglu (2008), using daily data for a sample of Nasdaq stocks, find no evidence that institutions have superior information about forthcoming earnings announcements.

Seasholes (2000) investigates Taiwanese stock exchange and finds that foreigners tend to buy prior to positive and sell prior to negative earnings surprises. Foreigners' returns are above risk-adjusted returns.

(b) During earnings-announcement period

Since informed investors already trade on their private information during the pre-earnings-announcement period, it is unlikely they will continue to trade during earnings-announcement and post-earnings-announcement periods. After earnings announcement, the private information becomes public information. Therefore, informed investors have no more information advantage. Bernard and Thomas (1990) find that a significant portion of PEAD is concentrated in a three-day window around the earnings announcement. Their results imply that investors on average do not understand the implications of current quarterly earnings for future earnings. These investors are probably not well informed.

The attention-grabbing hypothesis by Lee (1992) conjectures that, whether the news is good or bad, individual investors are likely to be net buyers of any stock in the news. Individual investors with irrationality or cognitively constrain have less attention than institutional investors. These individual investors are more likely to buy the stocks when stocks which they currently do not own grab their attention. Based on this hypothesis, prices rise too much (or fall too little) in response to information released around earnings announcements, due to buying by individual investors. Barber and Odean (2004), Hirshleifer et al. (2004), and Dey and Radhakrishna (2007) find that individual investors trade heavily and are net buyers on earnings announcements, no matter whether the news is good or bad. Their finds support the attention-grabbing hypothesis. However, Burch and Swaminathan (2003) document that institutional investors buy after both positive and negative earnings surprises.

Ayers, Li, and Yeung (2009) examines whether the distinct drifts are attributable to different identifiable subsets of investors who exhibit systematic delayed trading reactions to

different forms of earnings innovations. During the earnings announcement period, while the market as a whole reacts to both random walk-based earnings surprise (RW) and the analyst-based earnings surprise (AF), it reacts more intensive to AF earnings surprises. While smaller traders react more to the RM earnings surprises than to the AF earnings surprises, large trades appear to response only to AF earnings surprises. These trading behaviors during earnings announcement period and during post-earning-announcement period are similar.

(c) Post-earnings-announcement period

During the post-earnings-announcement period, several studies document that the less PEAD is observed when the market has more the firm specific information. Foster, Olsen and Shevlin (1984), Bernard and Thomas (1989), Freeman and Tse (1989), Hong, Lim and Stein (2000), Bartov, Radhakrishnan and Krinsky (2000), Francis, Lafond, Olsson and Schipper (2004), and Vega (2005) find that the bigger firms expedite information flow in the market and have lower PEAD.

Several researchers believe that individual investors are less sophisticated traders than are institutional investors, including Lee et al. (1991), Walther (1997), Grinblatt and Keloharju (2000), De Franco et al. (2006), and Mikhail et al. (2007). The individual trading hypothesis conjectures that PEAD may result from the trading activity of individuals. Recently, Lamont and Frazzini (2007) find that, for some stocks, buying pressure from individuals push prices higher around announcement dates. However, other researchers find that individual investors do not cause PEAD. Hirshleifer, Myers, Myers, and Teoh (2008) find no indication that trading by individuals explains the concentration of drift at subsequent earnings announcement dates, which is inconsistent the individual trading hypothesis. Individuals are significant net buyers after *both* negative and positive extreme earnings surprises. In summary, the literature provides the mixed results of the effect of individual investors on PEAD.

The impact of institutional on post-earnings announcement drift is also far from resolved. More recent evidence from changes in institutional ownership is mixed as to whether institutions are sophisticated arbitrageurs. Bartov, Radhakrishnan and Krinsky (2000) find that PEAD is

negatively related to the proportion of shares held by institutional investors. The results imply that institutional investors improve the degree to which earnings information is efficiently priced. Ke and Ramalingegowda (2005) document that transient institutional investors (i.e., those actively trading to maximize short term profits) trade to exploit the post-earnings announcement drift (PEAD). Their arbitrage trades accelerate the speed that stock prices reflect the implications of current earnings for future earnings. Griffin, Shu and Topaloglu (2008) find that stock returns over the next three months are positively related to changes in institutional ownership in the two days after earnings announcements. Post-earnings announcement drift is significantly lower for stocks with higher institutional holdings. In contrast, Griffin, Shu and Topaloglu (2008) study the information content of institutional trading in the days immediately preceding earnings announcements. They find no evidence that institutional trading in the days before earnings announcements helps to predict earnings announcement returns.

The PEAD literature documents two different types of earnings surprises:

- random walk-based (RW) earnings surprise
- analyst-based (AF) earnings surprise

There is no consensus regarding the source(s) of these drifts. The effects of different investor types on the RW and AF drifts are inconclusive. The decreasing in RW drift with the level of institutional ownership was documented by Bartov, Radhakrishnan, and Krinsky (2000). They conclude that institutional investors improve the efficiency with which RW earnings surprises are priced. Bhattacharya (2001) finds that, during earnings announcement period, small traders' earnings expectation resembles a seasonal random walk. Battalio and Mendenhall (2005) find that, around earnings announcements, large traders respond to AF earnings surprises while small traders respond to RW earnings surprises. Mikhail, Walther and Willis (2007) document that while large traders trade in the directions of recommendations and forecast revisions, small traders fail to do so. Ayers, Li, and Yeung (2009) examines whether the distinct drifts are attributable to different identifiable subsets of investors who exhibit systematic delayed trading reactions to different forms of earnings innovations. While large traders continue to trade in the direction of analyst-based earnings surprises, small traders continue to trade in the direction of seasonal random walk-based earnings surprises after earnings announcements. Large traders

end their delayed trading more quickly than small traders. Overall, these findings imply that the RW and AF drifts may be explained by distinct groups of investors that form their earnings expectations differently, who both impact prices and systematically underreact to earnings news.

However, these previous studies classify investors as small or large traders based on trade sizes. They fail to link trade sizes to different investor groups. Easley and O'Hara (1987), Lee (1992), Franco, Lu and Vasvari (2007), Bhattacharya, Black, Christensen, and Mergenthaler (2007), and Ayers, Li, and Robinson (2008) find that small traders represents individual investors. In contrast, Barclay and Warner (1993), Chakravarty (2001), Campbell, Ramadorai, and Vuolteenaho (2005) point out that small traders could represent either individuals or instead institutions' splitting their trades into smaller trades. To reduce the price impact of their trades, sophisticated investors split orders and make smaller trades when they disagree with the market price. Furthermore, Campbell et al. (2005) provide evidence that institutions tend to make both very large and very small trades, with individuals tending to make intermediate-sized trades.

2.8. Problems with Informed Trading Measurement (PIN)

Informed trading cannot be directly measured. Based on the Glosten and Milgrom (1985) and Easley and O'Hara (1987) sequential trade models, the Easley, Kiefer, O'Hara and Paperman (1996) develop a model to measure informed trading. The underlying assumptions are:

- private information is reflected in abnormal order flow, excess buying or excess selling pressure, and
- public information is directly incorporated into prices without trading activity.

Any order imbalance would be interpreted as trades motivated by private information. By observing the abnormal order flow in a given day, PIN is designed to capture the extent of informed trading. The model contains three types of traders:

- informed traders who trade, based on private information, for speculative purposes,

- an uninformed liquidity provides or market makers who, by observing the flow of buy and sell orders, sets the bid and ask quotes. The bid-ask spread compensates the liquidity provider for the possibility of trading with the informed traders, and
- noise traders whose reasons for trading are exogenous.

The process is illustrated in Figure 2.1. The probability that a private information event will occur on a given day is α. If a private information event occurs on a particular day, the probability of good news is (1-δ). In this model, traders arrive according to Poisson process throughout the day. On days with good news, informed traders and noise traders arrive in the market as buyers at rates μ and ε_b, respectively. But, only noise traders arrive to sell at rate ε_s. On bad news day, the arrival rates for buy orders and sell orders are ε_b and $\mu+\varepsilon_s$, respectively. If there is no private signal, only noise traders will arrive in the market, so buy and sell orders flow arrives at rate ε_b and ε_s, respectively. The probability of informed trading is the ratio of expected informed order flow to expected total order flow.

$$PIN = \frac{\alpha\mu}{\alpha\mu + \varepsilon_b + \varepsilon_s} \tag{1}$$

The PIN model can be numerically estimated using maximum likelihood method. The likelihood function of the model is:

$$L(\theta \mid B,S) = (1-\alpha)e^{-\varepsilon_b}\frac{\varepsilon_b^B}{B!}e^{-\varepsilon_s}\frac{\varepsilon_s^S}{S!} + \alpha\delta e^{-\varepsilon_b}\frac{\varepsilon_b^B}{B!}e^{-(\mu+\varepsilon_s)}\frac{(\mu+\varepsilon_s)^S}{S!} + \alpha(1-\delta)e^{-(\mu+\varepsilon_b)}\frac{(\mu+\varepsilon_b)^B}{B!}e^{-\varepsilon_s}\frac{\varepsilon_s^S}{S!} \tag{2}$$

where

B : total buys for a given day

S : total sells for a given day

$\theta = (\alpha, \delta, \mu, \varepsilon_b, \varepsilon_s)$

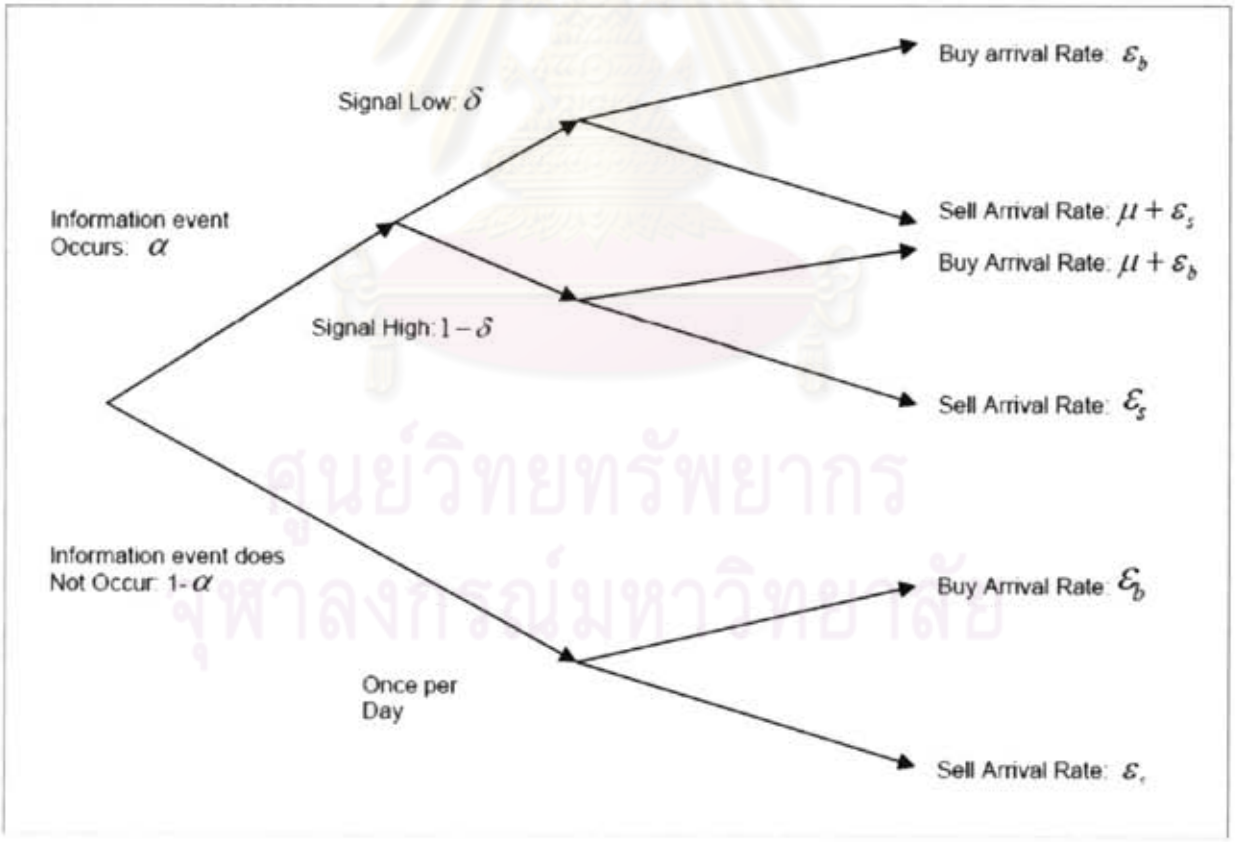
Assuming the information events are independent across days, the likelihood function of observing I days is given by

$$L(\theta \mid M) = \prod_{i=1}^{I} L(\theta \mid B_i, S_i) \tag{3}$$

where

$M = [(B_1, S_1), \ldots, (B_I, S_I)]$

Figure 2.1: Tree of the PIN model



To estimate the parameters, we need a numerical maximization technique because there is no closed form solution. To increase computing efficiency and reduce truncation error, Easley et al. (2003 and 2005) recommend the following factorization of the joint likelihood function

$$L(\theta \mid M) = \sum_{i=1}^{I}\left[-\varepsilon_b - \varepsilon_s + M_i(\ln x_b + \ln x_s) + B_i \ln(\mu + \varepsilon_b) + S_i \ln(\mu + \varepsilon_s)\right] + \sum_{i=1}^{I} \ln\left[\alpha(1-\delta)e^{-\mu} x_s^{S_i - M_i} x_b^{-M_i} + \alpha\delta e^{-\mu} x_s^{-M_i} x_b^{B_i - M_i} + (1-\alpha) x_s^{S_i - M_i} x_b^{B_i - M_i}\right] \quad (4)$$

where

$$M_i = \frac{\min(B_i, S_i) + \max(B_i, S_i)}{2}$$

$$x_s = \frac{\varepsilon_s}{\mu + \varepsilon_s}$$

$$x_b = \frac{\varepsilon_b}{\mu + \varepsilon_b}$$

Easley, Hvidkjaer and O'Hara (2002) show that a ten percent difference in the PINs of two stocks results in a 250 basis point difference in their annual expected returns. Constructing a rational expectations asset pricing model with asymmetric information, Easley and O'Hara (2004) find that uninformed investors demand a premium to hold shares in firms with higher information asymmetry, everything else held constant. The uninformed investors expect to lose to the informed investors and therefore demand to be compensated for this expected loss. They argue that stocks with more information asymmetry have higher expected returns.

However, many other researchers' findings do not support the previous results. Lambert, Leuz and Verrecchia (2005) and Hughes, Liu and Liu (2005) show that in a large economy the effect of asymmetric information on expected returns is diversifiable or subsumed by existing risks. They argue that asymmetric information is priced in Easley and O'Hara (2004) because the number of assets in their model is finite and hence asymmetric information risk cannot be diversified away. Spiegel and Wang (2005) suggest that PIN captures a stock's liquidity characteristics and whether liquidity is a systematic risk is unclear. Mohanram and

Rajgopal (2007) show that while PIN does predict future returns in Easley and O'Hara (2004) sample, the effect is not robust to alternative specifications and time periods. Overall, their findings cast doubt on whether PIN reflects information risk systematically priced by investors. There is not much evidence to support the interpretation that information risk, proxied by PIN, is a source of priced information risk.

Duarte and Young (2007) show that the original PIN model cannot match the pervasive positive correlation between buyer and seller initiated order flow because the PIN model specifies only two possible motives for trades, information and exogenous liquidity needs. Then they extend the PIN model to accommodate the positive correlation between buys and sells by allowing for simultaneous positive shocks to both buy and sell order flow. The extended model also allows them to compute a measure of asymmetric information, AdjPIN. The results indicate that AdjPIN is orthogonal to expected returns. Their evidence suggests that PIN is not priced because it is a proxy for information asymmetry.

The extended model has the following differences:

- the arrival rate of informed buyers (μ_b) and the arrival rate of informed sellers (μ_s) are different. The motivation for this is to better allow the model to account for the fact that in the data, buy order flow has a larger variance than sell order flow for almost all firms.
- The model allows for symmetric order flow shock, i.e. both increased buys and sells variations and a positive correlation between buys and sells because each day an event can occur that causes both buy and sell order flow to increase. The probabilities of such events, conditional on with and without private information, are represented by θ' and θ, respectively.
- In the event of symmetric order flow shock, the additional arrival rate of buys is Δ_b and sells is Δ_s.

The probability of informed trading in the adjusted model is:

$$\text{AdjPIN} = \frac{\alpha\left(\delta\mu_b + (1-\delta)\mu_s\right)}{\alpha\left(\delta\mu_b + (1-\delta)\mu_s\right) + (\Delta_b + \Delta_s)\left(\alpha\theta' + (1-\alpha)\theta\right) + \varepsilon_b + \varepsilon_s} \tag{5}$$

The probability of systematic order flow shock (PSOS) is the unconditional probability that a given trade will come from a shock to both buy and the sell order flows which is given by:

$$\text{PSOS} = \frac{(\Delta_b + \Delta_s)\left(\alpha\theta' + (1-\alpha)\theta\right)}{\alpha\left(\delta\mu_b + (1-\delta)\mu_s\right) + (\Delta_b + \Delta_s)\left(\alpha\theta' + (1-\alpha)\theta\right) + \varepsilon_b + \varepsilon_s} \tag{6}$$

The likelihood function of the extended model is:

$$\begin{aligned} L(\theta \mid B,S) = {} & (1-\alpha)(1-\theta)e^{-\varepsilon_b}\frac{\varepsilon_b^B}{B!}e^{-\varepsilon_s}\frac{\varepsilon_s^S}{S!} \\ & + (1-\alpha)\theta e^{-(\varepsilon_b+\Delta_b)}\frac{(\varepsilon_b+\Delta_b)^B}{B!}e^{-(\varepsilon_s+\Delta_s)}\frac{(\varepsilon_s+\Delta_s)^S}{S!} \\ & + \alpha(1-\theta')(1-\delta)e^{-(\varepsilon_b)}\frac{(\varepsilon_b)^B}{B!}e^{-(\mu_s+\Delta_s)}\frac{(\mu_s+\Delta_s)^S}{S!} \\ & + \alpha\theta'(1-\delta)e^{-(\varepsilon_b+\Delta_b)}\frac{(\varepsilon_b+\Delta_b)^B}{B!}e^{-(\mu_s+\varepsilon_s+\Delta_s)}\frac{(\mu_s+\varepsilon_s+\Delta_s)^S}{S!} \\ & + \alpha(1-\theta')\delta e^{-(\mu_b+\varepsilon_b)}\frac{(\mu_b+\varepsilon_b)^B}{B!}e^{-(\varepsilon_s)}\frac{(\varepsilon_s)^S}{S!} \\ & + \alpha\theta'\delta e^{-(\mu_b+\varepsilon_b+\Delta_b)}\frac{(\mu_b+\varepsilon_b+\Delta_b)^B}{B!}e^{-(\varepsilon_s+\Delta_s)}\frac{(\varepsilon_s+\Delta_s)^S}{S!} \end{aligned} \tag{7}$$

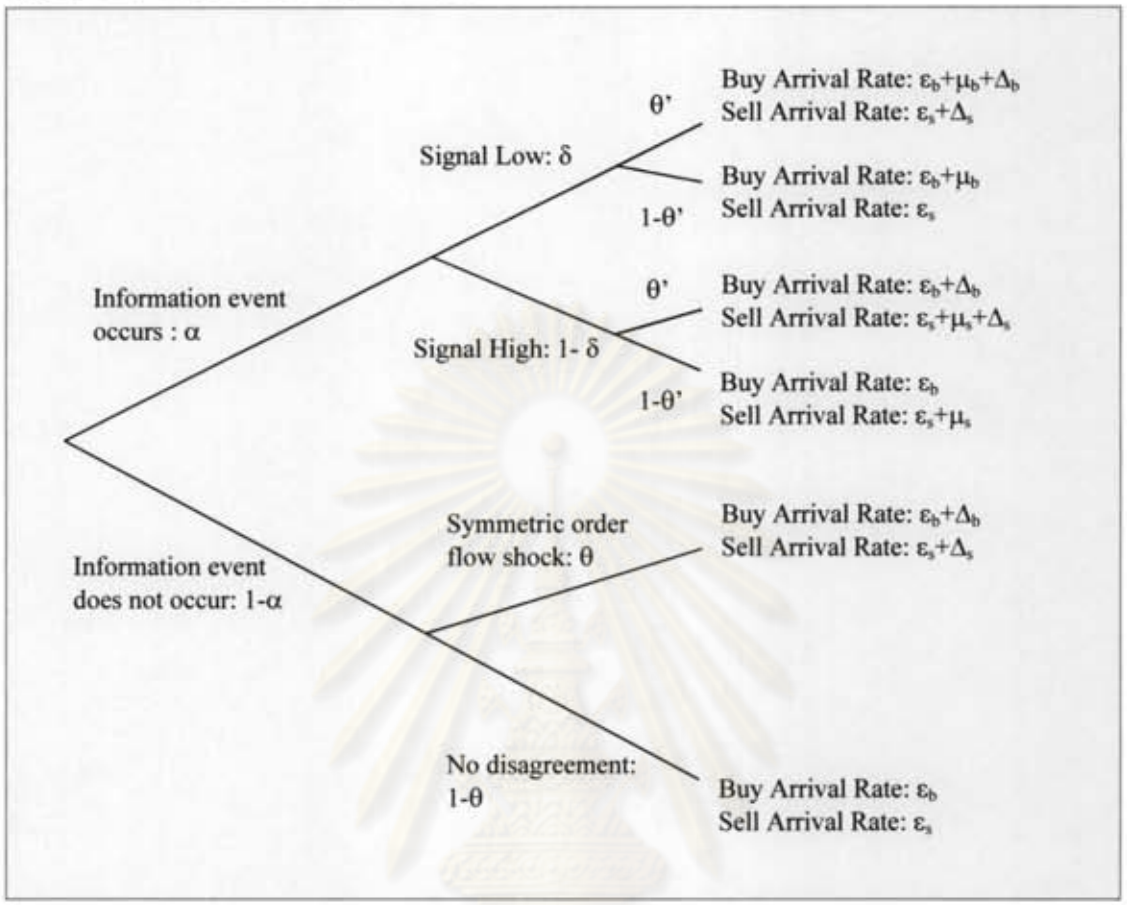
where

B : the number of buys for a given day

S : the number of sells for a given day

$\theta = (\alpha, \mu_b, \mu_s, \varepsilon_b, \varepsilon_s, \delta, \theta, \theta', \Delta_b, \Delta_s)$

Figure 2.2: Tree of the AdjPIN model



Shocks with a high PSOS have very low trading activity on most days with sudden spikes in volume associated with the release of public information. In addition to being related to illiquidity, while the correlation between PSOS and AdjPIN is relatively low, PSOS is strongly correlated with PIN indicating that PSOS is the component of PIN that proxies for illiquidity unrelated to asymmetric information. Consequently, the relation between expected returns and PSOS reveals the extent to which PIN is priced because it is a proxy for illiquidity effects unrelated to information asymmetry. The evidence does suggest that the relation between expected returns and illiquidity cannot be explained by information asymmetry effects.

2.9. Investor protection

Investor protection is defined as the extent of the laws that protect investors' rights and the strength of the legal institutions that facilitate law enforcement. Strong investor protection is an essential feature of good corporate governance. LaPorta et. al. (1998 and 2000), Shleifer and Wolfenzon (2002) and Castro, Clementi, and Macdonald (2002) have shown the positive effect of investor protection on a country's efficiency of corporate governance, breadth and depth of capital markets, and economic growth. When investor protection is weak, investors feel uncomfortable about their investment, which increases the cost of financing and reduces its availability. In contrast, investors are willing to pay more for securities, and firms are able to finance their projects through financial markets more easily under good investor-protection environment.

Grishchenko et al (2002) examine the dynamic relation between return and volume of individual stocks in Russia and other emerging markets. They find strong evidence of return continuation following high volume days, suggesting the presence of private information trading in emerging markets. The private information trading is especially strong around major corporate event dates. In addition, stocks in countries that enforce insider-trading law and provide better investor protection exhibit less private information trading. Brockman and Chung (2002) investigate the relation between investor protection and firm liquidity on the Hong Kong equity market. They find that firm liquidity is significantly affected by investor protection. Hong Kong-based equities exhibit narrower spreads and thicker depths than their China-based counterparts. Wang, Liao, and Deng (2003) test the hypotheses that poor investor-protection environments lead to higher information asymmetry in security markets using data from the Security Exchange of Hong Kong (SEHK). They compare China-based stocks, which operate in a relatively unprotected environment, to Hong Kong-based stocks. The information component in the market friction of China stocks is shown to be up to 20% larger than that of Hong Kong-based stocks. They conclude that poor investor protection on the China mainland produces high information friction in the market.

DeFond and Hung (2003) measure investor protection and stock price informativeness around the world, shown in Table 1. They define the variables as the following:

- *Investor protection laws* is the extent of the laws that protect investors, ranging from 0 to 5 and aggregates the following components of investor rights:
  (1) ability to vote by mail,
  (2) ability to gain control of shares during the investors' meeting,
  (3) possibility of cumulative voting for directors,
  (4) ease of calling an extraordinary investors meeting, and
  (5) availability of mechanisms allowing minority investors to make legal claims against the directors.
- *Law enforcement institutions* is the mean score of three legal enforcement variables. The index ranges from 0 to 10, with higher scores for greater law enforcement.
  (1) efficiency of the judicial system, that assesses the efficiency and integrity of the legal environment,
  (2) rule of law, that assesses the rule and order tradition in a country, and
  (3) corruption, which assesses the corruption in government.
- *Stock price informativeness* measures the extent that stock prices move in the same direction in a country, with higher scores for lower stock price informativeness.

While U.K. and U.S. have extensive investor protection laws and strong law enforcement institutions and high stock price informativeness, Thailand has limited investor protection laws, extremely weak law enforcement institutions and low stock price informativeness. Assuming a negative relationship between investor protection and information asymmetry, as suggested by the previous studies, information asymmetry and informed trading should be clearer observed in Thailand than in U.K. and U.S.A..

Table 2.1: Investor protection and stock price informativeness around the world

Country	Investor protection laws	Law enforcement institutions	Stock price informativeness
Australia	4	9.5	61.4
Austria	2	9.4	66.2
Belgium	0	9.4	65.0
Brazil	3	6.1	64.7
Canada	4	9.8	58.3
Chile	3	6.5	66.9
Denmark	3	10.0	63.1
Finland	2	10.0	68.9
France	2	8.7	59.2
Germany	1	9.1	61.1
Greece	1	6.8	69.7
Hong Kong	4	8.9	67.8
India	2	5.6	69.5
Indonesia	2	2.9	67.1
Italy	0	7.1	66.6
Japan	2	9.2	66.6
Korea	1	5.6	70.3
Malaysia	3	7.7	75.4
Mexico	0	5.4	71.2
Netherlands	2	10.0	64.7
Norway	3	10.0	66.6
Pakistan	4	3.7	66.1
Philippines	4	3.5	68.8
Portugal	2	7.2	61.2
Singapore	3	8.9	69.7
South Africa	4	6.4	67.2
Spain	2	7.1	67.0
Sweden	2	10.0	66.1
Taiwan	3	7.4	76.3
Thailand	3	4.9	67.4
Turkey	2	4.8	74.4
U.K.	4	9.2	63.1
U.S.	5	9.5	57.9
Descriptive statistics			
Mean	2.48	7.58	66.53
Standard deviation	1.28	2.15	4.43
Q1	2.00	6.13	64.70
Median	2.00	7.72	66.60
Q3	3.00	9.44	68.90

Chapter III

Research Hypothesis

3.1. Price Momentum

The demand for information is driven by information asymmetry. Informed investors can be broadly classified into two groups:

- insiders such as boards, executives, and managers. They periodically reveal information through news announcements.
- informed traders such as bankers, stock analysts, and hedge fund managers. Through trading, they reveal their information and play a significant role in incorporating their superior information, compared to uninformed traders' information, into prices.

Wang's (1994) model of competitive stock trading shows the relationship between the nature of heterogeneity among investors and the behavior of trading volume and its relation to price dynamics. The uninformed investors cannot predict and immediately identify the informed investors' trading motives. Then they learn to correct their initial assessments. The abnormal trading volume is larger when the information asymmetry is greater. This model has the following predictions:

- With private information, the stocks with high turnover exhibit return continuation. Under the learning process, uninformed investors gradually update their cash-flow expectations and imitate the informed investors' trading strategy. Their learning process and trading behavior cause return continuation.
- Without private information, the stocks with high turnover exhibit return reversals.

Using the probability of informed trading (PIN) in Easley, Hvidkjaer, and O'Hara (2002) as a proxy for asymmetric information, Hameed, Hong, and Warachka (2008) shows the existence of a cross-sectional relationship between informed trading and momentum effect. Overall, their results support Wang's (1994) predictions.

Recent studies find that foreign investors are better informed than the local individual investors in the Stock Exchange of Thailand. Therefore, based on Wang's (1994) model, the local individual investors' trading causes return continuation.

Hypothesis I:

I.1 With information asymmetry, the stocks with high turnover exhibit return continuation.

I.2 Without information asymmetry, the stocks with high turnover exhibit return reversals.

Hypothesis II:

II.1 With information asymmetry, the stocks with high buying by the local individual investors exhibit return continuation.

II.2 Without information asymmetry, the stocks with high buying by the local individual investors exhibit return reversals.

3.2. Earnings Momentum

(a) Pre-earnings announcement period

Prior to news announcements, investors accumulate information and form their expectations. When the news announcements are inconsistent with market expectations, it is likely that informed traders with superior information will trade during the pre-announcement period. Because of their inferior information, unformed traders are less likely to trade. Amin (2007) investigates the extent of informed trading during the pre- and the post-dividends announcements periods. His study finds evidence of higher informed trading during the pre announcements period compared to post announcements period only when dividends announcements are informative. The literature documents that foreign investors are better informed than local Thai investor. Therefore, this study expects that, given an earnings surprise, sophisticated foreign investors should trade shares in the days prior to the next quarterly earnings announcement to take advantage of the private information.

Hypothesis III:

If earnings announcements are informative, there is high foreign trading during the pre-announcements period.

III.1 For positive earnings surprise, foreign buying is higher during pre-announcements period.

III.2 For negative earnings surprise, foreign selling is higher during pre-announcements period.

(b) During earnings-announcement period

Since informed investors already trade on their private information during the pre-earnings-announcement period, they are unlikely to continue to trade during earnings-announcement and during post-earnings-announcement periods. After earnings announcement, the private information becomes public information. Therefore, informed investors have no more information advantage. Bernard and Thomas (1990) find that investors on average do not understand the implications of current quarterly earnings for future earnings. The previous studies show that Thai investors are less informed than foreign investors. Therefore, this study expects that local individual investors are likely to trade during earnings-announcement and during post-earnings-announcement periods.

Ayers, Li, and Yeung (2009) document that smaller traders react more to the random walk-based earnings surprises (RW) and large trades appear to response only to analyst-based earnings surprises (AF). Large traders are typically considered relatively more financially sophisticated than small traders since they utilize a more sophisticated earnings expectation (Bhattacharya, 2001, Battalio and Mendenhall, 2005, and Mikhail, Walther and Willis, 2007). In addition, Easley and O'Hara (1987) and Lee (1992) document that large traders are likely wealthier and more informed than small traders. Therefore, this study expects that, on average, large trades are initiated by institutional investors and small trades are initiated by individual investors.

Hypothesis IV:

IV.1 Individual investors are more likely to trade shares in the direction of seasonal random walk-based (RW) earnings surprises during earnings announcements.

IV.2 Institutional investors are more likely to trade shares in the direction of analyst-based (AF) earnings surprises during earnings announcements.

(c) Post-earnings-announcement period

Ayers, Li, and Yeung (2009) find that trading behaviors of small and large trades during earnings announcement period and during post-earning-announcement period are similar. Therefore, this study expects that individual investors and institutional investors will continue to trade during the post-earnings announcement period.

Hypothesis V:

V.1 Individual investors are more likely to trade shares in the direction of seasonal random walk-based (RW) earnings surprises after earnings announcements.

V.2 Institutional investors are more likely to trade shares in the direction of analyst-based (AF) earnings surprises after earnings announcements.

If individual investors' and institutional investors' activities help explain the RW and AF drifts, respectively, the relations between the RW and AF drifts and the respective trading intensity by individual investors and institutional investors around the earnings announcements are expected. Ayers, Li, and Yeung (2009) find that when large traders trade more intensely in the direction of the AF earnings surprises during the announcement period, the magnitude of the subsequent AF drift is lower. Likewise, when small traders trade more intensely in the direction of the RW earnings surprises during the announcement period, the magnitude of the RW drift is lower.

Hypothesis VI:

VI.1 The more intense the earnings announcement period trading by individual investors on the seasonal random walk-based (RW) earnings surprises, the smaller the post earnings announcement drift associated with seasonal random walk-based earnings surprises.

VI.2 The more intense the earnings announcement period trading by institutional investors on the analyst-based (AF) earnings surprises, the smaller the post earnings announcement drift associated with analyst-based earnings surprises.

Chapter IV

Data

This study uses the listed firms on the Stock Exchange of Thailand (SET). The SET utilized a fully computerized trading system, called the Automated System for the Stock Exchange of Thailand (ASSET) since May 31, 1991. There are two primary trading methods: Automatic Order Matching (AOM), which is the main system; and Put-Through (PT), which is the support system. Under AOM, brokerage firms submit their orders on-line to the ASSET system, and the orders are arranged according to price-then-time priority. Under PT, brokers can deal and negotiate directly. The result is sent to the ASSET system for approval after the negotiation is completed. The SET trading days run from Monday through Friday. Two trading periods are from 10:00 to 12:30 and from 14:30 to 16:30. A call market system is utilized to determine the opening price of each security in the morning and afternoon sessions. Investors are allowed to place one of the seven order types: market order, limit order, at-the-open order, at-the-close order, immediate-or-cancel order, fill-or-kill order, and conditioned published order. The SET classifies investors into one of the four types: (1) local individuals, (2) local institutional, (3) proprietary trading of brokers, and (4) foreign investors.

Local institutional or proprietary trading are grouped together since this study is interested in the trading behaviors of the local individual investors, the local institutional investors, and the foreign investors. Therefore, this study classifies investors into one of the following three investor types: (1) local individuals, (2) local institutional or proprietary trading, and (3) foreign investors.

4.1. Price Momentum

The initial sample consists of listed firms on SET during 1999 to 2007. The stocks with turnover volume less than 5% of total turnover volume by each investor type are excluded from this study. The resulting sample consists of 1125 firm-years. Each sample has sufficiently large

trading activity for each investor group. Therefore, their turnovers have visible impact on the return profiles.

Other variables such as monthly average stock properties, number of shares in issue, free float number of shares, turnover by volume, market capitalization, book-to-market, forecast earnings per share, and stock price are from Thomson Reuters DataStream.

Table 4.1 reports characteristics of the sample by year. In general the sample consists of 32% firm-years from the SET. There is an increasing trend of size. The average size is increasing about 3 folds from year 1999 to 2007. Turnover is on increasing and decreasing trends from year 1999 to 2003 and from year 2003 to 2007, respectively. Turnover reached a peak on year 2003, during Thaksin's government. On average 60% of turnover volumes are from individual investors, 27% and 13% are from institution, and foreign investors, respectively. After year 2003, the proportions of individual investors and foreign investors are decreasing and increasing, respectively. However, the proportion of institutional investors remains unchanged.

The characteristics of the selected firms are summarized in Table 4.2. The averaged monthly return is 2.40%. Its 10^{th} and 90^{th} percentiles are -11.21% and 15.58%, respectively. The standard deviation is about 9 folds of its mean. They imply the volatility of the SET. Size, book-to-market (BM), analysts' forecast dispersion (Disp), and turnover are positive skewness. Their standard deviations are significant larger than their means. The distributions of PIN, AdjPIN and $(1\text{-}R^2)$ are less skewed. Their means are significant larger than their standard deviations. The average of PIN is about 0.222. It means that, on averaged, about 22.2% of investors are informed investors. However, AdjPIN shows lower informed investors, with averaged of 14.4%. The distribution of $(1\text{-}R^2)$ is negative skewness. Its mean is 0.818 which implies that the unpredictable portion of the return is relative large. It is normal for an emerging market.

Table 4.1: Numbers and turnovers by volumes of listed firms and selected firms

Year	Listed Firms	Sample		Size	Turnover by volume	Turnover by ratio	% Traded by Investor Types		
							Individual	Institution	Foreign
2007	453	140	31%	21,944	57,579	0.044	50%	16%	34%
2006	447	150	34%	19,811	69,095	0.060	52%	14%	34%
2005	445	144	32%	18,351	77,383	0.071	55%	15%	30%
2004	415	154	37%	17,259	89,679	0.117	63%	13%	24%
2003	379	147	39%	11,235	134,215	0.413	66%	13%	21%
2002	357	116	32%	8,119	74,260	0.522	63%	13%	24%
2001	346	74	21%	5,974	64,255	0.486	66%	10%	24%
2000	339	89	26%	6,237	20,800	0.128	63%	12%	26%
1999	343	111	32%	7,348	35,717	0.198	57%	14%	28%
Total	3524	1125	32%	13,542	70,014	0.215	60%	13%	27%

Table 4.2: Characteristics of the sample

Parameters	r	Size	BM	Disp	Turnover by volume	Turnover by ratio	PIN	AdjPIN	$(1-R^2)$
Mean	2.40	13,542	1.004	53.9	70,014	0.215	0.222	0.144	0.818
P10	-11.21	300	0.347	0.0	10	0.000	0.158	0.063	0.491
P50	0.31	2,415	0.971	4.8	4,551	0.023	0.222	0.138	0.901
P90	15.58	26,589	2.326	70.8	150,160	0.330	0.290	0.227	0.997
SD	20.76	44,325	4.465	300.4	269,208	1.223	0.059	0.067	0.207

4.2. Earnings Momentum

The initial sample consists of listed firms on SET during 2004 to 2007. Other variables such as turnover by volume, market capitalization, forecast earnings per share, and stock price are from Thomson Reuters DataStream.

Table 4.3 reports summary statistics. The seasonal random walk-based (RW) earnings surprise has negative skewness distribution while the analyst-based (AF) earnings surprise has normal distribution. Both RW and AF earnings surprises have negative means. They imply that, on average, this data set has bad earnings surprises. In another work, the market overestimates the companies' performances. Size has positive skewness distribution. Cumulative abnormal return (CAR) has normal distribution. During the pre-earnings announcement period, the average order flow imbalances (AOFI) are -0.010, 0.005, and 0.002 for individual investors, institutional investors, and foreign investors, respectively. It means that institutional investors and foreign investors buy while the individual investors sell during this period. During the earnings announcement period, the average order flow imbalances (AOFI) are 0.002, -0.009, and -0.032 for individual investors, institutional investors, and foreign investors, respectively. It means that institutional investors and foreign investors sell while the individual investors buy during this period. During the post-earnings announcement period, the average order flow imbalances (AOFI) are 0.006, 0.002, and -0.009 for individual investors, institutional investors, and foreign investors, respectively. It means that individual investors and institutional investors buy while the foreign investors sell during this period.

The characteristics of seasonal random walk-based (RW)-sorted portfolios are reported in Table 4.4. There is a positive monotonic relationship between seasonal random walk-based (RW) and analyst-based (AF) earnings surprise. The relationship between the random walk-based (RW) earnings surprise and cumulative abnormal return is also positively monotone. During earnings announcement periods, buying from institutional investors are significantly higher in P5 than in P1 portfolio. It means that institutional investors buy more when there is high positive seasonal random walk-based (RW) earnings surprise.

Table 4.3: Summary Statistics of the key variables

					Average Order Flow Imbalance (AOFI)								
					Pre-Earnings Announcement			During-Earnings Announcement			Post-Earnings Announcement		
Parameters	RW	AF	Size	CAR	Individual	Institution	Foreign	Individual	Institution	Foreign	Individual	Institution	Foreign
Mean	-0.016	-0.001	74,801	-0.001	-0.010	0.005	0.002	0.002	-0.009	-0.032	0.006	0.002	-0.009
P10	-0.046	-0.018	3,649	-0.003	-0.149	-0.114	-0.240	-0.199	-0.142	-0.321	-0.120	-0.085	-0.199
P50	-0.003	-0.001	30,627	-0.001	-0.002	0.003	-0.009	-0.001	-0.002	-0.034	0.001	0.007	-0.025
P90	0.015	0.019	207,308	0.003	0.134	0.127	0.230	0.187	0.131	0.228	0.126	0.084	0.187
SD	0.092	0.043	118,928	0.003	0.149	0.116	0.244	0.251	0.176	0.330	0.112	0.099	0.224

Table 4.4: Characteristics of Seasonal Random Walk-Based (RW)-Sorted Portfolios

RW-Sorted					Average Order Flow Imbalance (AOFI)								
					Pre-Earnings Announcement			During-Earnings Announcement			Post-Earnings Announcement		
Portfolio	RW	AF	Size	CAR	Individual	Institution	Foreign	Individual	Institution	Foreign	Individual	Institution	Foreign
P1	-0.103	-0.024	60,950	-0.0006	0.000	0.005	0.005	-0.006	-0.030	-0.056	0.012	0.006	-0.021
P2	-0.011	-0.001	68,121	+0.0002	-0.024	0.024	-0.047	0.009	0.027	-0.024	0.004	0.011	-0.015
P3	-0.002	-0.002	133,840	+0.0002	0.007	-0.002	0.034	0.024	-0.033	-0.015	-0.008	0.003	-0.011
P4	0.003	0.006	111,263	+0.0005	-0.036	-0.004	0.032	-0.026	-0.048	-0.032	-0.003	-0.014	0.042
P5	0.023	0.016	85,454	+0.0006	0.007	-0.006	-0.006	0.019	0.021	-0.023	0.030	-0.003	-0.028
P5 - P1	0.126	0.040	24,504	+0.001	0.007	-0.012	-0.011	0.025	0.051	0.032	0.018	-0.010	-0.008
	5.02	4.14	1.20	2.18	0.35	-0.78	-0.35	0.77	2.26	0.68	1.05	-0.74	-0.25

Table 4.5 reports the characteristics of analyst-based (AF)-sorted portfolios. Similar to the seasonal random walk-based (RW)-sorted portfolios, there is a positive monotonic relationship between seasonal random walk-based (RW) and analyst-based (AF) earnings surprise. During pre-earnings announcement periods, there are significant differences in trading for institutional and foreign investors between P1 and P5 portfolios. While foreign investors tend to buy for high positive analyst-based earnings surprise, institutional investors tend to sell during this period.

Table 4.6 reports the characteristics of size-sorted portfolios. There is no clear evidence of the differences in average order flow imbalances during the pre-earnings announcement, during-earnings announcement, and post-earning announcement periods.

Figures 4.1, 4.2, and 4.3 plot the distributions of average order flow imbalance (AOFI) during pre-earnings announcement period, during earnings announcement period, and post-earnings announcement period, respectively. They all have similar profiles. Foreign investors tend to have highest absolute value of AOFI, for both positive and negative while individual investors tend to have the lowest absolute of AOFI.

Table 4.5: Characteristics of analyst-based (AF)-Sorted Portfolios

AF-Sorted					Average Order Flow Imbalance (AOFI)								
					Pre-Earnings Announcement			During-Earnings Announcement			Post-Earnings Announcement		
Portfolio	RW	AF	Size	CAR	Individual	Institution	Foreign	Individual	Institution	Foreign	Individual	Institution	Foreign
P1	-0.037	-0.072	64,350	0.0004	-0.008	0.026	-0.049	0.022	-0.014	-0.056	0.009	0.001	-0.027
P2	-0.005	-0.008	94,446	-0.0002	-0.009	0.002	0.027	0.054	-0.010	-0.099	0.007	0.018	-0.030
P3	-0.001	-0.007	107,813	-0.0002	0.003	0.019	-0.026	-0.024	-0.005	-0.010	-0.007	0.016	-0.004
P4	0.005	-0.003	103,228	-0.0007	-0.028	-0.007	0.040	-0.034	0.008	-0.031	0.009	0.004	-0.018
P5	0.036	0.009	84,466	-0.0004	-0.009	-0.015	0.018	-0.009	-0.025	0.035	0.009	-0.030	0.035
P5 - P1	0.074	0.081	20,116	-0.001	-0.001	-0.041	0.067	-0.031	-0.011	0.091	0.000	-0.031	0.062
	3.37	7.83	0.98	-1.58	-0.06	-2.18	2.27	-0.90	-0.36	1.39	0.00	-1.65	1.25

Table 4.6: Characteristics of Size-Sorted Portfolios

Size-Sorted Portfolio	RW	AF	Size	CAR	Average Order Flow Imbalance (AOFI)								
					Pre-Earnings Announcement			During-Earnings Announcement			Post-Earnings Announcement		
					Individual	Institution	Foreign	Individual	Institution	Foreign	Individual	Institution	Foreign
P1	-0.033	0.002	6,613	-0.0007	0.004	0.005	-0.014	0.015	-0.062	0.009	-0.009	-0.020	0.016
P2	-0.014	0.002	19,939	0.0001	-0.019	0.009	-0.013	0.000	0.015	-0.063	0.007	0.005	-0.018
P3	-0.025	-0.009	47,949	-0.0002	-0.003	-0.020	0.025	0.003	0.016	-0.048	0.016	0.009	-0.023
P4	-0.008	0.000	86,450	-0.0001	-0.007	0.021	-0.029	0.017	-0.005	-0.044	0.018	0.004	-0.025
P5	-0.003	0.001	293,354	0.0000	-0.026	0.011	0.040	-0.026	-0.010	-0.014	-0.005	0.011	0.006
P5 - P1	0.029	-0.001	286,741	0.001	-0.030	0.006	0.054	-0.041	0.052	-0.023	0.004	0.031	-0.009
	1.64	-0.14	12.90	1.46	-1.37	0.30	1.68	-0.82	1.59	-0.50	0.21	1.70	-0.20

Figure 4.1: Average Order Flow Imbalance During Pre-Earnings Announcement Period

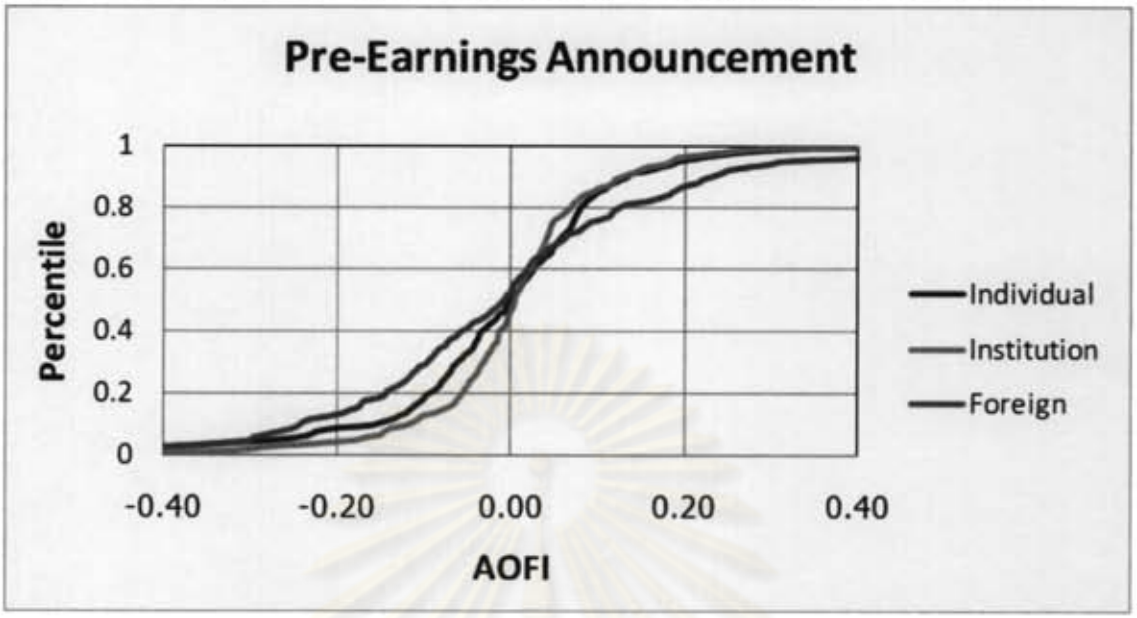


Figure 4.2: Average Order Flow Imbalance During-Earnings Announcement Period

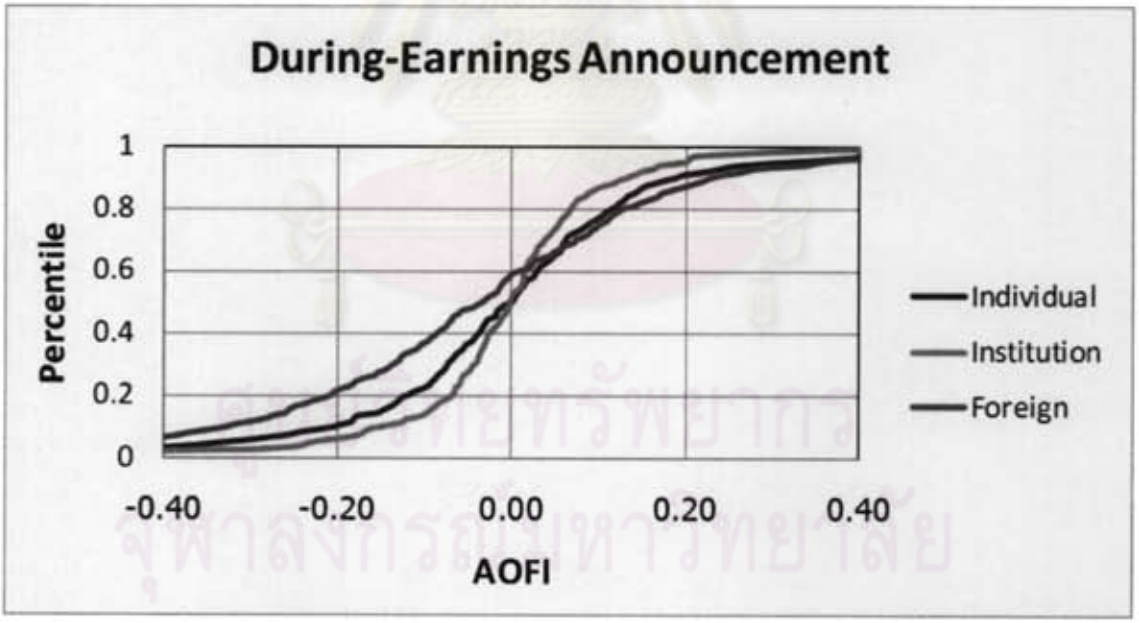
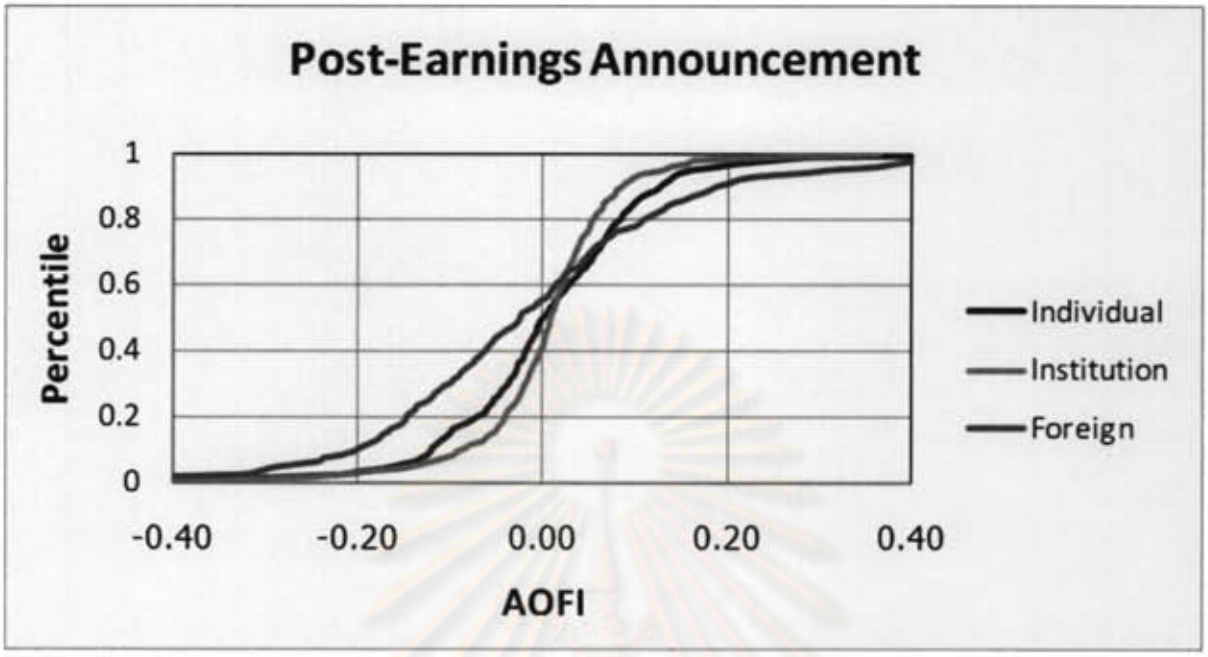


Figure 4.3: Average Order Flow Imbalances During Post-Earnings Announcement Period



Chapter V

Methodology

5.1. Measurement of information asymmetry

Informed trading is unobservable and cannot be directly measured. This study uses several proxies to approximate it.

(A) Probability of Informed Trading (PIN)

Regardless of its measurement error, this research will also use PIN as a measure of informed trading. It yields two benefits:

- testing the robustness of results of the previous studies, and
- testing whether the investors' behaviors in the USA and SET are the same.

This study extends the original probability of informed trading (PIN) to accommodate trades initiated by different types of traders. The likelihood function of the extended model is:

$$L(\theta \mid B,S) = (1-\alpha)\prod_{i=1}^{3}\left(\frac{e^{-2\varepsilon_i}\varepsilon_i^{B_i+S_i}}{B_i!S_i!}\right) + \alpha(1-\delta)\prod_{i=1}^{3}\left(\frac{e^{-(\mu_i+2\varepsilon_i)}\varepsilon_i^{S_i}(\mu_i+\varepsilon_i)^{B_i}}{B_i!S_i!}\right)$$

$$+ \alpha\delta\prod_{i=1}^{3}\left(\frac{e^{-(\mu_i+2\varepsilon_i)}\varepsilon_i^{B_i}(\mu_i+\varepsilon_i)^{S_i}}{B_i!S_i!}\right) \qquad (1)$$

where

α : the probability that a private information event will occur on a given day

δ : the probability of bad news

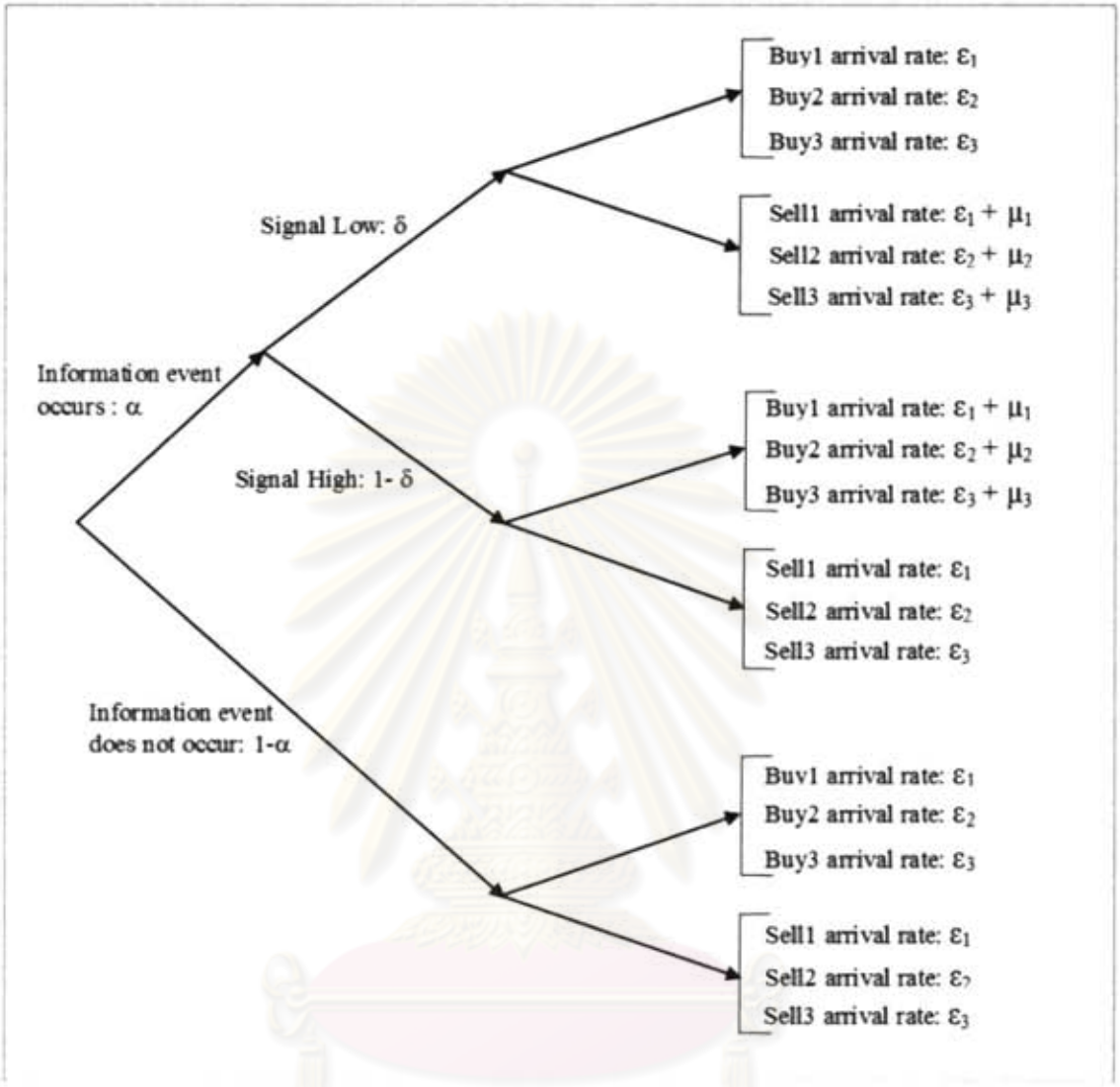
B_i : total buys initiated by investors type "i" for a given day

S_i : total sells initiated by investors type "i" for a given day

μ_i : arrival rate of informed investors type "i"

ε_i : arrival rate of uninformed investors type "i"

Figure 5.1: Tree of the extended PIN model



Using maximum likelihood method to numerically estimate the parameters in the above model, the probabilities of informed trading for individual investors, institutional investors, and foreign investors are calculated, respectively, as:

$$PIN_1 = \frac{\alpha \mu_1}{\alpha \mu_1 + 2\varepsilon_1} \quad (2)$$

$$PIN_2 = \frac{\alpha \mu_2}{\alpha \mu_2 + 2\varepsilon_2} \quad (3)$$

$$PIN_3 = \frac{\alpha \mu_1}{\alpha \mu_3 + 2\varepsilon_3} \tag{4}$$

(B) Adjusted Probability of Informed Trading (AdjPIN)

As shown in the previous section, Duarte and Young (2007) find that liquidity effects unrelated to information asymmetry explain the relation between PIN and the cross-section of expected returns. They propose AdjPIN, which is consistent with the high variances of buys and sells and the positive correlation between buys and sells, as a proxy for information asymmetry. This study extends the adjusted probability of informed trading (AdjPIN) to accommodate trades initiated by different types of traders.

The likelihood function of the extended AdjPIN model is:

$$\begin{aligned}
L(\theta \mid B,S) = {} & (1-\alpha)(1-\theta)\prod_{i=1}^{3}\left(e^{-\varepsilon_{ib}}\frac{\varepsilon_{ib}^{B_i}}{B_i!}e^{-\varepsilon_{is}}\frac{\varepsilon_{is}^{S_i}}{S_i!}\right) \\
& + (1-\alpha)\theta\prod_{i=1}^{3}\left(e^{-(\varepsilon_{ib}+\Delta_{ib})}\frac{(\varepsilon_{ib}+\Delta_{ib})^{B_i}}{B_i!}e^{-(\varepsilon_{is}+\Delta_{is})}\frac{(\varepsilon_{is}+\Delta_{is})^{S_i}}{S_i!}\right) \\
& + \alpha(1-\theta')(1-\delta)\prod_{i=1}^{3}\left(e^{-(\varepsilon_{ib})}\frac{(\varepsilon_{ib})^{B_i}}{B_i!}e^{-(\mu_{is}+\Delta_{is})}\frac{(\mu_{is}+\Delta_{is})^{S_i}}{S_i!}\right) \\
& + \alpha\theta'(1-\delta)\prod_{i=1}^{3}\left(e^{-(\varepsilon_{ib}+\Delta_{ib})}\frac{(\varepsilon_{ib}+\Delta_{ib})^{B_i}}{B_i!}e^{-(\mu_{is}+\varepsilon_{is}+\Delta_{is})}\frac{(\mu_{is}+\varepsilon_{is}+\Delta_{is})^{S_i}}{S_i!}\right) \\
& + \alpha(1-\theta')\delta\prod_{i=1}^{3}\left(e^{-(\mu_{ib}+\varepsilon_{ib})}\frac{(\mu_{ib}+\varepsilon_{ib})^{B_i}}{B_i!}e^{-(\varepsilon_{is})}\frac{(\varepsilon_{is})^{S_i}}{S_i!}\right) \\
& + \alpha\theta'\delta\prod_{i=1}^{3}\left(e^{-(\mu_{ib}+\varepsilon_{ib}+\Delta_{ib})}\frac{(\mu_{ib}+\varepsilon_{ib}+\Delta_{ib})^{B_i}}{B_i!}e^{-(\varepsilon_{is}+\Delta_{is})}\frac{(\varepsilon_{is}+\Delta_{is})^{S_i}}{S_i!}\right)
\end{aligned} \tag{5}$$

where

α : the probability that a private information event will occur on a given day

δ : the probability of bad news

θ' : the probability of symmetric order flow shock with private information

θ : the probability of symmetric order flow shock without private information

B_i : total buys initiated by investors type "i" for a given day

S_i : total sells initiated by investors type "i" for a given day

μ_{ib} : arrival rate of informed investors type "i" with buys-initiated trades

μ_{is} : arrival rate of informed investors type "i" with sells-initiated trades

ε_{ib} : arrival rate of uninformed investors type "i" with buys-initiated trades

ε_{is} : arrival rate of uninformed investors type "i" with sells-initiated trades

Δ_{ib} : additional arrival rate of investors type "i" with buys-initiated trades during the event of symmetric order flow shock

Δ_{is} : additional arrival rate of investors type "i" with sells-initiated trades during the event of symmetric order flow shock

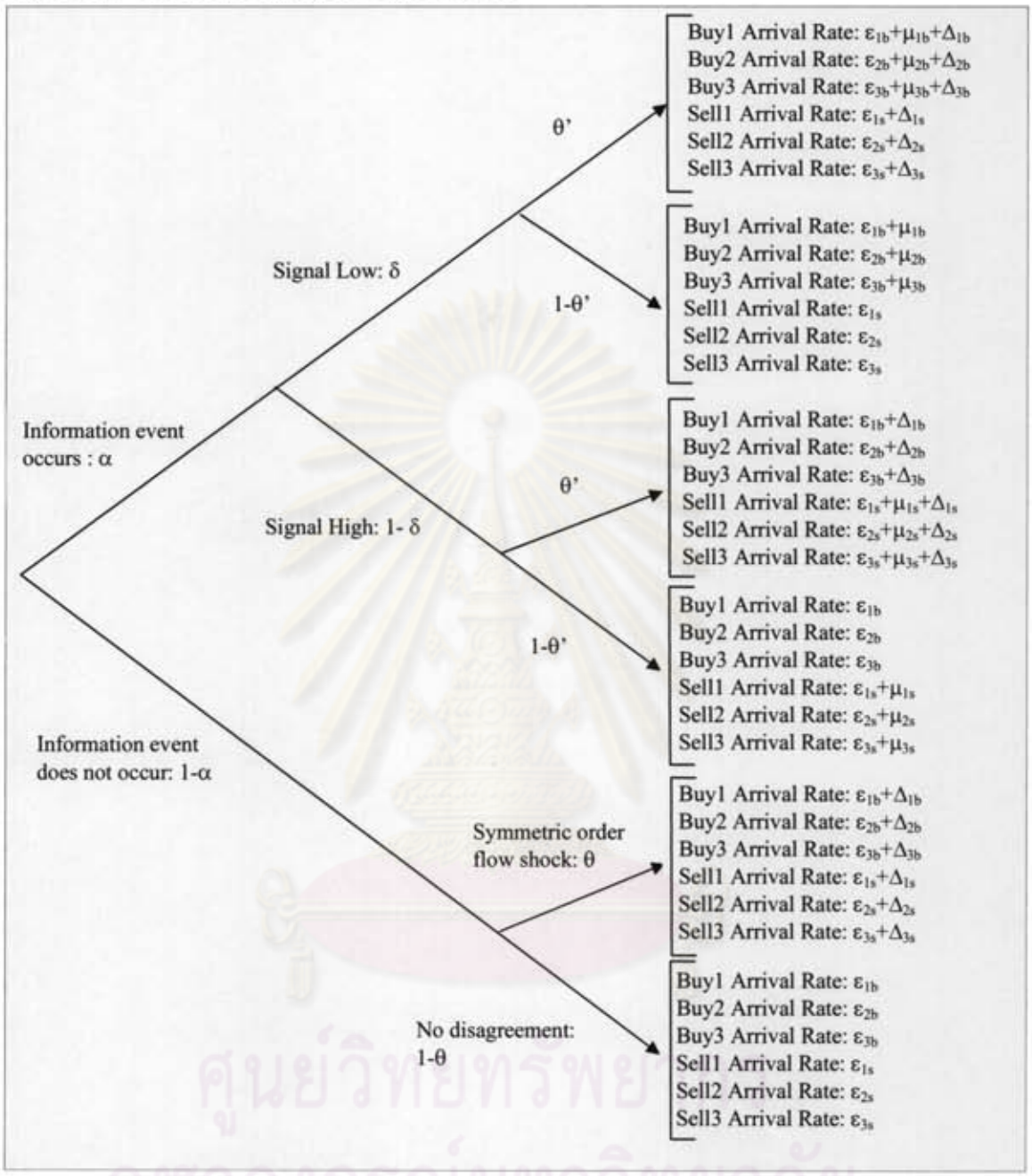
Using maximum likelihood method to numerically estimate the parameters in the above model, the probabilities of informed trading in the extended adjusted-model for individual investors, institutional investors, and foreign investors are defined, respectively, as:

$$\mathrm{AdjPIN}_1 = \frac{\alpha\left(\delta\mu_{1b} + (1-\delta)\mu_{1s}\right)}{\alpha\left(\delta\mu_{1b} + (1-\delta)\mu_{1s}\right) + (\Delta_{1b} + \Delta_{1s})\left(\alpha\theta' + (1-\alpha)\theta\right) + \varepsilon_{1b} + \varepsilon_{1s}} \tag{6}$$

$$\mathrm{AdjPIN}_2 = \frac{\alpha\left(\delta\mu_{2b} + (1-\delta)\mu_{2s}\right)}{\alpha\left(\delta\mu_{2b} + (1-\delta)\mu_{2s}\right) + (\Delta_{2b} + \Delta_{2s})\left(\alpha\theta' + (1-\alpha)\theta\right) + \varepsilon_{2b} + \varepsilon_{2s}} \tag{7}$$

$$\mathrm{AdjPIN}_3 = \frac{\alpha\left(\delta\mu_{3b} + (1-\delta)\mu_{3s}\right)}{\alpha\left(\delta\mu_{3b} + (1-\delta)\mu_{3s}\right) + (\Delta_{3b} + \Delta_{3s})\left(\alpha\theta' + (1-\alpha)\theta\right) + \varepsilon_{3b} + \varepsilon_{3s}} \tag{8}$$

Figure 5.2: Tree of the extended AdjPIN model



(C) Idiosyncratic volatility, $(1-R^2)$

Given the stock return process, Roll (1988) attributes the differences between the actual returns and the predicted returns to:

- unpredictable movements in pervasive economic factors,
- unpredictable changes in the firm's market environment, and
- unpredictable firms' specific events.

The following adjusted R^2 is used to describe the predictability of the process.

$$R^2 = 1 - \frac{(T-1)}{(T-k-1)} \frac{s^2(e)}{s^2(r)} \tag{9}$$

where

T : the time-series sample size

k : number of systematic or non-diversifiable factors in the process

s(e) : the sample standard deviation of the error term

s(r) : the sample standard deviation of the return

The remaining portion, $(1-R^2)$, represents the unpredictable returns. This study will use $(1-R^2)$ to proxy information asymmetry.

Because of the uniqueness of SET data, this study can estimate PIN and AdjPIN for each investor type. Figure 5.3 plots the distributions of PINs for the sample, individual investors, institutional investors and foreign investors. It is clearly observed that individual investors' PIN has the first-order stochastic dominance over others' PIN. It means that individual investors have higher proportion of informed investors than other investor types. The distributions of AdjPIN are plotted in Figure 5.4. Individual investors' AdjPIN has the second-order stochastic dominance over others' AdjPIN. On averaged, its implication is similar to PIN distributions, more informed individual investors.

Figure 5.3: Distributions of PIN for different investor groups

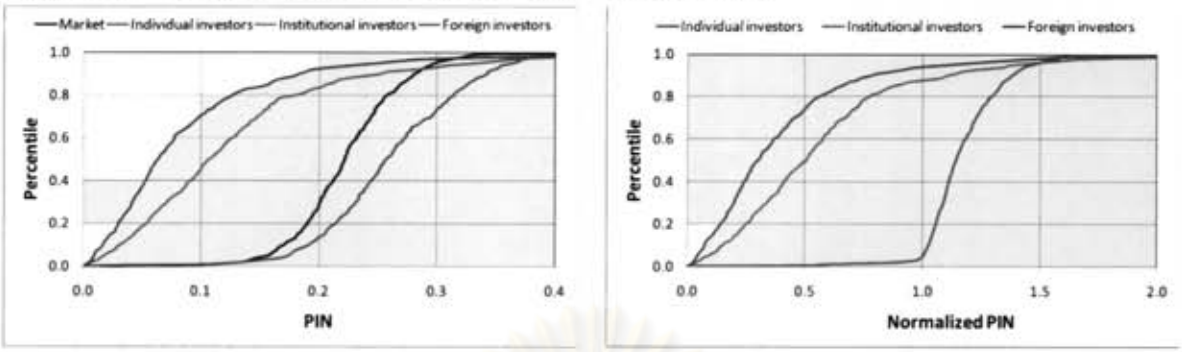
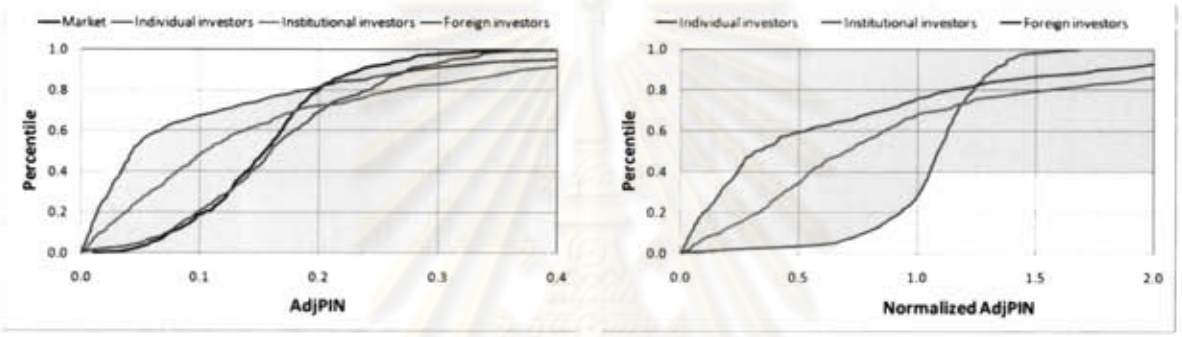


Figure 5.4: Distributions of AdjPIN for different investor groups



5.2. Information asymmetry and return continuation

Following Hameed, Hong, and Warachka's (2008), the product of past intermediate return with information asymmetry is used as an interaction variable to investigate the relationship between information asymmetry and return continuation. The intermediate horizon corresponds to the formation period of momentum strategies. Monthly individual stock returns are estimated as the following:

$$r_{i,t} = \beta_0 + \beta_1 \ln(Size_{i,t-1}) + \beta_2 BM_{i,t-1} + \beta_3 r_{i,t-1,t-1} + \beta_4 r_{i,t-12,t-2} + \beta_5 r_{i,t-60,t-13} + \beta_6 [IA_{i,t^*} * r_{i,t-12,t-2}] + \beta_7 [Disp_{i,t-1} * r_{i,t-12,t-2}] + \beta_8 [\lambda_{i,t^*} * r_{i,t-12,t-2}] + \varepsilon_{i,t} \quad (10)$$

where

$r_{i,t}$: return for firm "i" on month "t"

$r_{i,t-1,t-1}$: return for firm "i" on month "t-1"

$r_{i,t-12,t-2}$: return for firm "i" during month "t-12" and ""t-2"

$r_{i,t-60,t-13}$: return for firm "i" during month "t-60" and ""t-13"

$Size_{i,t-1}$: market capitalization for firm "i" on month "t-1"

$BM_{i,t-1}$: book-to-market for firm "i" on month "t-1"

IA_{i,t^*} : information asymmetry for firm "i" over the calendar year containing month "t"

$Disp_{i,t-1}$: forecast dispersion for firm "i" on month "t-1"

λ_{i,t^*} : Kyle (1985)'s lambda for firm "i" over the calendar year containing month "t"

ε_t : a mean-zero error term

The objective of this regression is to investigate whether the interaction between information asymmetry and past intermediate returns is responsible for return continuation. This specification takes into account intermediate-term momentum ($r_{i,t-12,t-2}$) and short-term ($r_{i,t-1,t}$) and long-term ($r_{i,t-60,t-13}$) reversals which are substantially documented in the literature. Based on Wang's (1994) predictions, β_6 is expected to be significantly positive.

Note that only one proxy for uncertainty and liquidity are included in the above specification to avoid multi-collinearity problem. Other proxies will also be used in as alternative specifications. In addition to PIN, other proxies for information asymmetry will also be used in the above regression.

Under Wang's (1994) model of competitive stock trading, turnover plays a significant role on the relationship between information asymmetry and future return. To investigation the model predictions, the product of past intermediate return with change in turnover and the product of past intermediate return with change in local individual investors' buying are used as interaction variables. Within information asymmetry portfolios, the following cross-sectional regressions will be used to test Hypothesis I and II:

$$r_{i,t} = \beta_0 + \beta_1 \ln(Size_{i,t-1}) + \beta_2 BM_{i,t-1} + \beta_3 r_{i,t-1,t} + \beta_4 r_{i,t-12,t-2} + \beta_5 r_{i,t-60,t-13} + \beta_6 [\Delta TO_{i,t} * r_{i,t-12,t-2}] + \varepsilon_{i,t} \quad (11)$$

$$\Delta TO_{i,t} = TO_{i,t-1,t-1} - TO_{i,t-12,t-2} \quad (12)$$

$$r_{i,t} = \beta_0 + \beta_1 \ln(Size_{i,t-1}) + \beta_2 BM_{i,t-1} + \beta_3 r_{i,t-1,t} + \beta_4 r_{i,t-12,t-2} + \beta_5 r_{i,t-60,t-13} + \beta_6 [\Delta NBuy_{1,t} * r_{i,t-12,t-2}] + \varepsilon_{i,t} \quad (13)$$

$$\Delta NBuy_{1,t} = NBuy_{1,t-1,t-1} - NBuy_{1,t-12,t-2} \quad (14)$$

where

$TO_{i,t-1,t-1}$: turnover for firm "i" on month (t-1)

$TO_{i,t-12,t-2}$: turnover for firm "i" during month (t-12) to month (t-2)

$NBuy_{1,t-1,t-1}$: net buying by the local individual investors for firm "i" on month (t-1)

$NBuy_{1,t-12,t-2}$: net buying by the local individual investors for firm "i" during month (t-12) to month (t-2)

Based on Wang's (1994) predictions, β_6 is expected to be significantly negative for the low information asymmetry portfolio, yielding return reversal. For the high information asymmetry portfolio, β_6 is expected to be significantly positive, yielding return continuation.

5.3. Order flow imbalance

For stock 'i', the daily Net Buy (NB) and daily trading Volume (V) are defined, respectively, as

$$NB_i = \sum_{m=1}^{M} B_{i,m} - \sum_{n=1}^{N} S_{i,n} \quad (15)$$

$$V_i = \sum_{m=1}^{M} B_{i,m} + \sum_{n}^{N} S_{i,n} \quad (16)$$

where

B : buy-initiated volumes

S : sell-initiated volumes

M : total number of buy-initiated trades on a given day

N : total number of sell-initiated trades on a given day

Define day '0' as an earnings announcement date. The Averages of the daily Net Buy (ANB) and of the daily trading Volume (AV) during the control period [-45,-8] are defined, respectively, as

$$ANB_i = \frac{\sum_{j=-45}^{-8} NB_{i,j}}{D} \quad (17)$$

$$AV_i = \frac{\sum_{j=-45}^{-8} V_{i,j}}{D} \quad (18)$$

where

D : the total number of days during the control period with available trading data

During the event periods, the Order Flow Imbalance (OFI) on day 'j' is defined as

$$OFI_{i,j} = \frac{NB_{i,j} - ANB_i}{AV_i} \quad (19)$$

This variable captures the excess trading activities during the event periods. The Average Order Flow Imbalance (AOFI) during an event window $[j_1, j_2]$ is defined as

$$AOFI_i = \frac{\sum_{j=j_1}^{j_2} OFI_{i,j}}{j_2 - j_1 + 1} \quad (20)$$

5.4. Earnings surprises

The seasonal random walk-based (RW) and analyst-based (AF) earnings surprises are defined, respectively, as

$$RW = \frac{EPS_t - EPS_{t-4}}{P_{t-1}} \tag{21}$$

$$AF = \frac{EPS_t - Forecast(EPS_t)}{P_{t-1}} \tag{22}$$

where

ESP_t : the actual earnings per share for quarter 't'

ESP_{t-4} : the actual earnings per share for quarter 't-4'

P_{t-1} : the stock price at the beginning of quarter 't'

Forecast(ESP_t): the analyst forecast earnings per share for quarter 't'

5.5. Trading before, during, and after earnings announcement

Using SET data, the investors can be classified into one of the three groups:

- individual investors (I1)
- institutional investors (I2)
- foreign investors (I3)

During the pre-earnings-announcement period [-7,-2], given earnings surprises, hypothesis III predicts that foreign investors with private information will be likely to trade. The following equation is used to test this hypothesis.

$$AOFI3_{i,t} = \beta_0 + \beta_1 RW_{i,t} + \beta_2 AF_{i,t} + \beta_3 \log(Size_{i,t}) + \varepsilon_{i,t} \tag{23}$$

where

$Size_{i,t}$: the market capitalization for firm 'i' for quarter 't'

The above regression includes firm's size because the literatures have documented that information asymmetry and liquidity are related to firm size. Based on the hypothesis III, β_1 and β_2 are expected to be positive and significant.

During the earnings announcement [-1,+1] and during the post-earnings-announcement periods [+2,+45], the trading behaviors of uninformed investors are expected to be the same. The following two equations are used to test hypothesis IV and V.

$$AOFI1_{i,t} = \beta_0 + \beta_1 RW_{i,t} + \beta_2 AF_{i,t} + \beta_3 \log(Size_{i,t}) + \varepsilon_{i,t} \quad (24)$$

$$AOFI2_{i,t} = \beta_0 + \beta_1 RW_{i,t} + \beta_2 AF_{i,t} + \beta_3 \log(Size_{i,t}) + \varepsilon_{i,t} \quad (25)$$

For individual investors, Eq.(24), β_1 is expected to be positive and significant but β_2 is expected to be insignificant. In contrast, for institutional investors Eq.(25), β_2 is expected to be positive and significant but β_1 is expected to be insignificant.

5.6. Post-earnings-announcement drift

To test the relationship between the intensity of trading by each investor type on the post-earnings-announcement drift or Cumulative Abnormal Return (CAR) on Hypothesis VI, the following equation is used:

$$\begin{aligned} CAR_{i,t} = {} & \beta_0 + \beta_1 RW_{i,t} + \beta_2 AF_{i,t} + \beta_3 AOFI1_{i,t} + \beta_4 AOFI2_{i,t} + \beta_5 AOFI3_{i,t} \\ & + \beta_6 RW_{i,t} * AOFI1_{i,t} + \beta_7 AF_{i,t} * AOFI1_{i,t} \\ & + \beta_8 RW_{i,t} * AOFI2_{i,t} + \beta_9 AF_{i,t} * AOFI2_{i,t} \\ & + \beta_{10} RW_{i,t} * AOFI3_{i,t} + \beta_{11} AF_{i,t} * AOFI3_{i,t} + \beta_{12} \log(Size_{i,t}) + \varepsilon_{i,t} \end{aligned} \quad (26)$$

where

$CAR_{i,t}$: the cumulative abnormal return during post-earnings-announcement period

The interaction terms between investors' order flow imbalance and earnings surprises are used to examine the relationship between the intensity of investors' trading and the post-earnings-announcement drift. Based on Hypothesis VI, β_6 and β_9 are expected to be negative and significant.

Chapter VI

Results and Discussions

This chapter tries to answer several financial puzzles about return momentum. First, we try to find out what the source(s) of the momentum is. Several recommended sources, including uncertainty, liquidity, information asymmetry, and disposition effect, will be tested whether they are responsible for momentum effects. Next, the Wang (1994)'s model predictions are tested, i.e., return momentum is only observed for stocks with high information asymmetry. Last, this study tries to investigate which investor group causes momentum effect.

6.1. Information asymmetry and return momentum

The objective of this section is to investigate whether information asymmetry, uncertainty, and/or liquidity are responsible for return momentum. This study builds on the effort of the previous work by Hameed, Hong, and Warachka's (2008). The product of information asymmetry and past short-term return is used as an interaction variable to investigate the relationship between information asymmetry and return momentum. To account for analyst forecast dispersion and Kyle's lambda, monthly individual stock returns are estimated as the following model:

$$r_{i,t} = \alpha_0 + \alpha_1 \ln(Size_{i,t-1}) + \alpha_2 BM_{i,t-1} + \alpha_3 r_{i,t-1,t-3} + \alpha_4 r_{i,t-4,t-18} + \alpha_5 [Disp_{i,t-1} * r_{i,t-1,t-3}] + \alpha_6 [\lambda_{i,t} * r_{i,t-1,t-3}] + \alpha_7 [IA_{i,t} * r_{i,t-1,t-3}] + \varepsilon_{i,t} \quad (1)$$

where

$r_{i,t}$: return for firm "i" on month "t"

$r_{i,t-1,t-3}$: average return for firm "i" during month "t-1" and "t-3"

$r_{i,t-4,t-18}$: average return for firm "i" during month "t-4" and "t-18"

$Size_{i,t-1}$: market capitalization for firm "i" on month "t-1"

$BM_{i,t-1}$: book-to-market for firm "i" on month "t-1"

$Disp_{i,t-1}$: forecast dispersion for firm "i" on month "t-1"

$\lambda_{i,t}$: Kyle (1985)'s lambda for firm "i" over the calendar year containing month "t"

$IA_{i,t}$: information asymmetry for firm "i" over the calendar year containing month "t"

ε_t : a mean-zero error term

This specification takes into account short-term momentum ($r_{i,t-1,t-3}$) and long-term ($r_{i,t-4,t-18}$) reversals. Note that only one proxy for uncertainty and liquidity are included in the above specification to avoid multi-collinearity problem. Other proxies will also be used in as alternative specifications.

The results of the pooled cross-section regression on the above model are reported in Table 6.1. For the base case, most of the coefficients are statistically significant, except the one for BM (α_2).The averaged monthly return is higher for small stocks than for big stocks since α_1 equals -0.0056, significant and negative. The coefficients for short-term momentum and long-term reversal equal 0.029 and -0.050, respectively, and significant. Even after controlling for size and book-to-market, future returns can be predicted using the short-term and long-term returns.

The momentum literature documents that uncertainty and liquidity are probably the potential sources of momentum. Jiang, Lee, and Zhang (2005) believe that uncertainty is related to analysts' forecast dispersion. P´astor and Stambaugh (2003) show that momentum return can be explained by Kyle (1985)'s lambda. Therefore, this study controls for analysts' forecast dispersion and Kyle (1985)'s lambda to evaluate the marginal effect of information asymmetry on return momentum. When the interaction terms of short-term return and analysts' forecast dispersion (Disp) and Kyle's Lambda (λ) are added to the regression, the effects of book-to-market (BM) on the return become stronger. α_2 are 0.0066 and 0.0053 for base case with Disp and base case with Kyle's Lambda, respectively. While the effects of short-term return become stronger, the effects of long-term return become weaker. The coefficients of the interaction terms of short-term return and analysts' forecast dispersion (Disp) and Kyle's Lambda (λ) are insignificant. In summary, uncertainty and liquidity are not responsible for return momentum.

Table 6.1: Return Continuation and Information Asymmetry

Parameter	Base Case	Base Case with Disp	Base Case with Kyle's lambda	Information Asymmetry (IA)					
				PIN		AdjPIN		$(1-R^2)$	
α_0	0.067	0.026	0.067	0.066	0.009	0.066	0.005	0.067	0.031
	9.81	3.75	7.71	8.74	1.04	8.58	0.64	8.70	3.62
α_1	-0.0056	-0.0019	-0.0060	-0.0059	-0.0007	-0.0058	-0.0004	-0.0057	-0.0024
	-6.75	-2.56	-6.01	-6.85	-0.81	-6.71	-0.46	-6.28	-2.72
α_2	0.0009	0.0066	0.0053	0.0046	0.0143	0.0045	0.0145	0.0020	0.0076
	1.75	5.29	4.81	4.72	8.55	4.61	8.74	2.20	4.51
α_3	0.029	0.061	0.042	-0.078	-0.232	0.049	0.003	-0.31	-0.394
	2.47	4.47	3.19	-1.54	-3.90	1.72	0.10	-6.36	-6.64
α_4	-0.050	0.001	-0.048	-0.034	0.018	-0.030	0.022	-0.059	-0.017
	-2.05	0.03	-1.83	-1.60	0.80	-1.40	0.96	-2.37	-0.71
α_5		-0.000020			-0.000022		-0.00001		0.000090
		-0.46			-0.39		-0.22		1.45
α_6			-430		-6398		2617		-2864
			-1.01		-1.12		0.47		-1.81
α_7				0.570	1.415	-0.062	0.456	0.429	0.602
				2.53	5.28	-0.33	1.99	7.19	8.35

When PIN is used as a proxy for information asymmetry, the effects of short-term and long-term returns become insignificant. The product of PIN and past short-term return is significant and positive. α_7 is 0.570. After controlling for uncertainty and liquidity, the effect of the production of PIN and past short-term return is even stronger. α_7 is 1.415. But α_5 and α_6 are insignificant. Future returns can be predicted by the interaction of information asymmetry and short-term returns, even after controlling for size, book-to-market, uncertainty and liquidity. It implies that information asymmetry causes return momentum, not uncertainty nor liquidity.

The results of this study are similar to the works of Hameed, Hong, and Warachka's (2008) which investigate the US market. The difference is that SET and US market have different return profile. This study find that SET has two monthly return profiles; short-term (1-3 months) momentum and long-term (4-18 month) reversal. US market has three monthly return profiles; short-term (1 month) reversal, intermediate-term (2-12 months) momentum, and long-term (13-60 months) reversal. In summary, return momentum can be explained by information asymmetry, not by size, book-to-market, uncertainty, nor liquidity.

Wang (1994) develops price discovery model with heterogeneous investors and asymmetric information. In this model, uninformed investors gradually learn from informed investors' trading strategies. The stocks with private information and ones without private information exhibit return momentum and return reversal, respectively. From Table 6.1, the effects of information asymmetry and short-term momentum on the future return can be rearranged as:

$$f(PIN_{i,t^*}, r_{i,t-1,t-3}) = [-0.232 + 1.415 * PIN_{i,t^*}] * r_{i,t-1,t-3} \quad (2)$$

The above equation indicates that short-term return ($r_{i,t-1,t-3}$) positively predicts future return when $PIN_{i,t^*} > 0.164$ and negatively predicts future return when $PIN_{i,t^*} < 0.164$. It implies that the return profiles exhibit momentum and reversal effects for high and low information asymmetry, respectively. These empirical evidences supports Wang (1994)'s model predictions.

When AdjPIN is used as a proxy for information asymmetry without controlling for uncertainty and liquidity, the effect of the information asymmetry is not significant. But its effect is stronger after controlling for uncertainty and liquidity. α_7 is 0.456. The coefficients for short-term return and long-term return are not significant. Since α_3 is insignificant, the return profile could not exhibit return reversal for low information asymmetry. It only exhibits return momentum for all level of information asymmetry. Similar to the previous results, uncertainty and liquidity fail to explain return. In summary, using AdjPIN as a proxy for information asymmetry partially supports Wang (1994)'s model predictions.

When $(1\text{-}R^2)$ is used as a proxy for information asymmetry, without controlling for uncertainty and liquidity, the coefficients for both short-term return and long-term return are significant and negative. The effect of the information asymmetry is significant. α_7 is 0.429. After controlling for uncertainty and liquidity, the results remain unchanged. The effects of uncertainty and liquidity are insignificant. The effects of information asymmetry and short-term momentum on the future can be rearranged as:

$$f\left(\left(1-R^2\right)_{,t^*}, r_{i,t-1,t-3}\right) = \left[-0.394 + 0.602 * \left(1-R^2\right)_{,t^*}\right] * r_{i,t-1,t-3} \qquad (3)$$

The return profiles exhibit momentum effect for $(1\text{-}R^2) > 0.654$ and reversal effect for $(1\text{-}R^2) < 0.654$. Overall, using PIN and $(1\text{-}R^2)$ as proxies for information asymmetry yield similar results.

To complement the pooled cross-sectional regression, the regression on PIN-sorted portfolios is performed. P1 and P5 are portfolios of stocks with low informed trading and high informed trading, respectively. The monthly individual stock returns are estimated as the following model:

$$r_{i,t} = \alpha_0 + \alpha_1 \ln(Size_{,t-1}) + \alpha_2 BM_{i,t-1} + \alpha_3 r_{i,t-1,t-3} + \alpha_4 r_{i,t-4,t-18} \qquad (4)$$

This specification only controls for size and book-to-market. There is no interaction term of information asymmetry and short-term return. From the previous results, it is obvious that uncertainty and liquidity could not explain future stock return. Including uncertainty and liquidity on the regression yields similar results. The results are reported in Table 6.2. The coefficients for size (α_1) are significant and negative for most of the portfolio, except P4. It confirms that the stock with larger size yields lower return. The coefficients for book-to-market (α_2) are significant for P3 and P4 only. They are indifferent between P1 and P5. The coefficients of short-term momentum (α_3) is only significant and positive on a portfolio of stocks with high informed trading, P5. It means that return momentum is clearly observed only for stocks with high information asymmetry. The coefficient of long-term reversal (α_4) is significant and negative only for P4. It means that return reversal is not clearly observed for stocks with low information asymmetry. Sorting the stocks based on AdjPIN or $(1-R^2)$ yield similar results. In summary, the results partially support Wang (1994)'s model predictions.

Table 6.2: Probability of Informed Trading and Return Pattern

PIN-Sorted Portfolio	α_0	α_1	α_2	α_3	α_4
P1	0.0569	-0.0048	0.0003	0.0172	-0.0194
	4.83	-3.07	0.52	0.95	-0.46
P2	0.1001	-0.0091	0.0012	0.0288	-0.0716
	5.94	-4.89	0.57	1.24	-1.54
P3	0.0514	-0.0042	0.0044	0.0452	-0.0534
	4.2	-2.98	3.68	1.7	-1.29
P4	0.0682	-0.0048	0.0090	-0.0174	-0.1776
	2.67	-1.84	2.04	-0.4	-2.39
P5	0.0975	-0.0099	0.0033	0.1949	-0.0917
	3.29	-2.76	0.93	3.48	-0.65

6.2. Investor trading and return Continuation

The previous section investigates the potential sources of return momentum without considering investors' trading activities. In this section, information asymmetry and investors' trading activities are taken into account. This study is aimed to test Wang (1994)'s model predictions, i.e. the relationship between information asymmetry and turnover and return momentum. In addition, this study tries to find out who cause return momentum.

Under Wang's (1994) model of competitive stock trading, turnover plays a significant role on the relationship between information asymmetry and future return. The presence of information asymmetry affects the return profile. To test the hypothesis, the product of past short-term return with change in turnover is used as an interaction variable. The regression model is the following:

$$r_{i,t} = \alpha_0 + \alpha_1 \ln(Size_{i,t-1}) + \alpha_2 BM_{i,t-1} + \alpha_3 r_{i,t-1,t-3} + \alpha_4 r_{i,t-4,t-18} + \beta_0 \Delta TO_{i,t} * r_{i,t-1,t-3} + \varepsilon_{i,t} \quad (5)$$

$$\Delta TO_{i,t} = TO_{i,t-1,t-1} - TO_{i,t-12,t-2} \quad (6)$$

where

$TO_{i,t-1,t-1}$: turnover for firm "i" on month (t-1)

$TO_{i,t-12,t-2}$: average turnover for firm "i" during month (t-12) to month (t-2)

The results are reported in Table 6.3. In Panel A, PIN is used as a proxy for information asymmetry. The stocks are sorted and classified into one of the PIN-sorted portfolios. Only the coefficients of the short-term momentum (α_3) and of the interaction term (β_0) are significant and positive in the (P5-P1) portfolio. These coefficients are significant in P5 portfolio but are insignificant in P1 portfolio. It implies that the future return can be predicted by the short-term momentum only for the stocks with high information asymmetry. Turnover causes different return profiles for P1 and P5. The results are partially consistent with Wang's (1994) prediction, i.e., with information asymmetry (P5), the stocks with high turnover exhibit return continuation.

However, without information asymmetry (P1), there is weak evident to support the prediction. Since the sign of β_0 is consistent with the prediction but is not statistical significant. In summary, using PIN as a proxy for information asymmetry partially supports Wang (1994)'s model predictions.

Table 6.3: Turnover, Probability of Informed Trading, and Return Pattern

Panel A: PIN as a proxy for information asymmetry

PIN-Sorted Portfolio	α_0	α_1	α_2	α_3	α_4	β_0
P1	0.0527	-0.0048	0.0022	0.0125	0.0548	-0.0113
	3.780	-2.650	2.710	0.590	1.230	-1.100
P2	0.1015	-0.0098	0.0048	-0.0039	-0.0169	0.0096
	4.960	-4.660	1.070	-0.150	-0.320	1.350
P3	0.0324	-0.0024	0.0077	-0.0122	0.0111	-0.0147
	2.440	-1.630	4.290	-0.410	0.270	-1.040
P4	0.0269	-0.0015	0.0169	-0.0241	-0.0293	-0.0109
	1.160	-0.670	3.860	-0.560	-0.470	-0.260
P5	0.0526	-0.0054	0.0093	0.2066	0.0600	0.0792
	1.330	-1.250	1.400	3.360	0.440	3.220
P5 – P1	-0.0001	-0.0006	0.0071	0.1941	0.0052	0.0905
	-0.002	-0.123	1.059	2.983	0.036	3.395

Table 6.3: Turnover, Probability of Informed Trading, and Return Pattern (continued)

Panel B: AdjPIN as a proxy for information asymmetry

AdjPIN-Sorted Portfolio	α_0	α_1	α_2	α_3	α_4	β_0
P1	0.0665	-0.0063	0.0024	0.0118	0.0545	0.0005
	5.240	-3.890	3.070	0.560	1.350	0.060
P2	0.1080	-0.0097	-0.0054	-0.0085	-0.0126	-0.0038
	5.860	-5.050	-1.390	-0.250	-0.250	-0.420
P3	-0.0194	0.0015	0.0320	0.0145	-0.0205	-0.0235
	-0.810	0.640	5.990	0.660	-0.380	-1.150
P4	0.0269	-0.0019	0.0055	-0.0020	-0.0049	0.3051
	1.920	-1.290	3.160	-0.050	-0.060	3.960
P5	-0.0969	0.0095	0.0386	-0.3099	0.0047	0.3520
	-1.820	1.800	2.810	-2.950	0.080	6.430
P5 – P1	-0.1634	0.0159	0.0362	-0.3217	-0.0498	0.3515
	-2.985	2.864	2.632	-3.003	-0.700	6.346

Table 6.3: Turnover, Probability of Informed Trading, and Return Pattern (continued)

Panel C: $(1-R^2)$ as a proxy for information asymmetry

$(1-R^2)$-Sorted Portfolio	α_0	α_1	α_2	α_3	α_4	β_0
P1	0.0593	-0.0123	-0.0001	-0.0624	0.1648	-0.0846
	5.560	-8.550	-0.390	-2.560	2.630	-8.610
P2	-0.1248	0.0109	0.0063	-0.0541	-0.1725	-0.0516
	-3.880	3.730	0.820	-1.980	-2.320	-2.480
P3	-0.0821	0.0077	0.0122	-0.0147	-0.0243	0.0143
	-4.360	4.070	3.900	-0.740	-0.630	1.890
P4	0.0538	-0.0045	0.0068	0.0566	0.0520	0.0061
	4.940	-3.630	4.310	3.190	1.690	0.780
P5	-0.1608	0.0158	0.0643	-0.1604	0.3258	0.0286
	-3.730	3.090	9.480	-1.980	2.110	1.370
P5 – P1	-0.2201	0.0281	0.0644	-0.0980	0.1610	0.1132
	-4.956	5.293	9.488	-1.158	0.966	4.911

AdjPIN is used as a proxy for information asymmetry and the results are reported in Panel B of Table 6.3. The coefficients of the short-term momentum (α_3) and of the interaction term (β_0) are significant in P5 portfolio but are insignificant in P1 portfolio. For P5 portfolio, the effects of the short-term momentum and changed in turnover on the future return can be described as:

$$f(\Delta TO_{i,t}, r_{i,t-1,t-3}) = [-0.3099 + 0.3520 * \Delta TO_{i,t}] * r_{i,t-1,t-3} \quad (7)$$

It means that the return profile exhibits momentum effect only when $\Delta TO_{i,t} > 0.88$. The return profile exhibits return reversal when the turnover is low, regardless of the high information asymmetry environment. In (P5 – P1) portfolio, most of the coefficients, except α_4, are significant. Overall, the results of PIN and AdjPIN are similar. Using AdjPIN as a proxy for information asymmetry, the evidences support the prediction about return momentum, but do not support the prediction about return reversal.

In Panel C of Table 6.3, ($1-R^2$) is used as a proxy for information asymmetry. For P1 portfolio, most of the coefficients, except α_2, are significant. The coefficients of the interaction term (β_0) and short-term return (α_3) are significant and negative which is consistent the Wang's (1994) prediction. The coefficient of long-term return (α_4) is significant and positive. Both short-term and long-term returns can explain the future return, but in different directions. When there is no information asymmetry, stocks with high turnover tends to exhibit return reversal. In P5 portfolio, most of the coefficients, except α_3 and β_0, are significant. The coefficient of the interaction term (β_0) is positive but insignificant. In summary, the evidences strongly support the prediction about return reversal but weakly support the prediction about return momentum. DeFond and Hung (2003) documented that Thailand has limited investor protection laws, extremely weak law enforcement institutions and low stock price informativeness. Therefore, information asymmetry and informed trading is expected to be clearer observed in Thailand. The results from the previous section confirm this belief. Regardless of high information asymmetry environment, foreign investors are expected to be better informed because of their knowledge and technology. SET provides unique data set which allows us to directly investigate

trading activities from each investor type without using a proxy. While the literature widely documented the existences of return momentum, there is no consensus on who causes the momentum effect. The unique data from SET allows us to answer this question. In the previous section, the turnover is used in the interaction variable. It does not differentiate between buy-initiated and sell-initiated transactions. To further investigate who cause momentum effect, the interaction of net buys and information asymmetry is included in the regression. The regression model is:

$$r_{i,t} = \alpha_0 + \alpha_1 \ln(Size_{i,t-1}) + \alpha_2 BM_{i,t-1} + \alpha_3 r_{i,t-1,t-3} + \alpha_4 r_{i,t-4,t-18} + \beta_0 \Delta NBuy_{i,j,t} * r_{i,t-1,t-3} + \varepsilon_{i,t} \quad (8)$$

$$\Delta NBuy_{i,j,t} = NBuy_{i,j,t-1,t-1} - NBuy_{i,j,t-12,t-2} \quad (9)$$

where

$NBuy_{i,j,t-1,t-1}$: net buying by investors type "j" for firm "i" on month (t-1)

$NBuy_{i,j,t-12,t-2}$: net buying by investors type "j" for firm "i" during month (t-12) to month (t-2)

The results are reported in Table 6.4. In Panel A, net buys from individual investors are used in the interaction variable. The stocks are sorted based on PIN into one of the five portfolios. The coefficient of the interaction term (β_0) is significant and negative only in P4 portfolio. In (P5-P1) portfolio, β_0 is negative and insignificant. It means that individual investors tend to buy the stocks when there is momentum effect. Therefore, it is unlikely that individual investors cause return momentum or return reversal.

Net buys from institutional investors are used in the interaction variable, in Panel B of Table 6.4. The coefficient of the interaction term (β_0) is significant and negative in P1 portfolio. It means that high net buys, above yearly average, from institutional investors cause return reversal under low information asymmetry environment. In addition, the coefficient of the short-term momentum (α_3) is also significant. The effect of the short-term return and net buys from institutional investors on the future return can be described as:

$$f(\Delta NBuy_{i,j,t}, r_{i,t-1,t-3}) = [0.0675 - 0.2567 * \Delta NBuy_{i,j,t}] * r_{i,t-1,t-3} \quad (10)$$

When there is low net buys, ΔNBuy < 0.263, the return profile exhibits return momentum. The return profile exhibits return reversal when there are high net buys, ΔNBuy >0.263. For P5 portfolio, the coefficient of the interaction term (β_0) is significant and positive. It means that high net buys from institutional investors cause return momentum. In summary, the evidences indicate that institutional investors cause return momentum and return reversal where there are high information asymmetry and low information asymmetry, respectively.

Table 6.4: Net Buys from Foreign Investors, Probability of Informed Trading, and Return Pattern

Panel A: net buys from individual investors

PIN-Sorted Portfolio	α_0	α_1	α_2	α_3	α_4	β_0
P1	-0.0304	0.0027	0.0128	0.0244	0.3811	0.1840
	-1.700	1.300	4.350	1.590	6.570	1.430
P2	-0.0184	0.0009	0.0232	0.0265	0.1141	-0.0802
	-0.870	0.420	5.640	1.000	3.670	-0.420
P3	0.0139	-0.0019	0.0201	0.0048	0.0500	-0.0480
	1.040	-1.360	6.780	0.310	1.520	-0.450
P4	-0.0048	0.0009	0.0169	-0.0450	-0.0096	-0.4278
	-0.350	0.630	6.850	-1.590	-0.290	-2.600
P5	-0.0383	0.0048	0.0151	0.2873	0.0583	-1.1917
	-0.480	0.510	1.740	2.920	0.220	-1.530
P5 – P1	-0.0079	0.0020	0.0023	0.2629	-0.3228	-1.3757
	-0.096	0.212	0.246	2.640	-1.191	-1.743

Table 6.4: Net Buys from Foreign Investors, Probability of Informed Trading, and Return Pattern (continued)

Panel B: net buys from institutional investors

PIN-Sorted Portfolio	α_0	α_1	α_2	α_3	α_4	β_0
P1	-0.0460	0.0050	0.0126	0.0675	0.1902	-0.2567
	-1.680	1.610	2.660	3.760	1.980	-3.320
P2	0.0095	-0.0019	0.0155	0.0303	0.3193	-0.1651
	0.290	-0.570	1.980	0.540	4.260	-1.370
P3	-0.0340	0.0026	0.0252	0.0122	0.0264	0.0543
	-1.910	1.410	6.800	0.870	1.010	1.380
P4	0.0150	-0.0013	0.0154	-0.0109	0.0648	0.1030
	1.250	-1.040	6.260	-0.610	2.150	2.650
P5	-0.1361	0.0153	0.0214	0.2360	-0.0331	0.8065
	-1.180	1.160	1.910	1.730	-0.110	2.640
P5 – P1	-0.0900	0.0103	0.0088	0.1685	-0.2233	1.0632
	-0.760	0.762	0.725	1.224	-0.706	3.374

Table 6.4: Net Buys from Foreign Investors, Probability of Informed Trading, and Return Pattern (continued)

Panel C: net buys from foreign investors

PIN-Sorted Portfolio	α_0	α_1	α_2	α_3	α_4	β_0
P1	-0.0144	0.0013	0.0103	0.0317	0.3629	-0.0099
	-0.740	0.550	3.220	2.060	4.890	-0.160
P2	-0.0179	0.0006	0.0222	0.0569	0.3647	0.1683
	-0.400	0.130	2.180	0.640	2.810	0.840
P3	-0.0134	0.0004	0.0221	0.0127	0.0683	0.0419
	-0.870	0.260	6.890	0.930	2.750	1.060
P4	0.0156	-0.0014	0.0173	-0.0087	0.0265	0.0337
	1.420	-1.220	8.000	-0.510	0.920	0.820
P5	0.0184	-0.0022	0.0130	0.1643	0.0297	0.5110
	0.350	-0.400	1.870	2.010	0.190	3.290
P5 – P1	0.0329	-0.0035	0.0026	0.1326	-0.3333	0.5209
	0.654	-0.644	0.384	1.804	-2.136	3.475

In Panel C of Table 6.4, net buys from foreign investors are used in the interaction variable. The coefficient of the interaction term (β_0) is significant only in P5 portfolio. It implies that high net buys from foreign investors cause momentum effect under high information asymmetry environment. However, there is no evident that they cause return reversal when there is low information asymmetry. Since β_0 is insignificant in P1 portfolio. In summary, foreign investors cause return momentum, not return reversal.

The financial literatures provide the mixed results about who cause momentum effect. This study provides clear results on SET which has high information asymmetry. While return momentum is driven by trading initiated by institutional investors and foreign investors, return reversal is driven by trading initiated only by institutional investors. Individual investors do not cause these return profiles. From Wang (1994)'s price discovery model, trading of uninformed investors cause return momentum. Therefore, the model implies that individual investors are more informed than institutional investors and foreign investors. This result is consistent with the distributions of PIN and AdjPIN, illustrated in Figure 5.3 and 5.4, respectively. It is obvious that individual investors have higher probability of informed trading than other types of investors. In summary, the empirical evidences clearly indicate that individual investors are more informed than institutional investors and foreign investors.

6.3. Trading during pre-earnings announcement period

Prior to news announcements, informed investors will trade to take advantages of their private information. The objective of this section is to test whether there are informed trading prior to earnings announcement and to find out who are informed traders. This study focuses on the average order flow imbalance (AOFI) which captures the excess trading activities during [-7, -2] window.

The results of hypothesis testing are reported in Table 6.5. The AOFIs of individual investors, institutional investors, and foreign investors are reported in Panels A, B, and C of Table 6.5, respectively. Given earnings surprise, there are no significant trading patterns for any investor types during this period. β_1 and β_2 are insignificant for all investor types. The results imply that no investor group has private information private information prior to earnings announcement. Therefore, the hypothesis III is rejected.

Table 6.5: Average Order Flow Imbalance During Pre-Earnings Announcement Period

Panel A: individual investors

Model	β_0	β_1	β_2	β_3
1	0.0526	0.0724	-0.0663	-0.0057
	0.83	0.82	-0.33	-0.96
2	0.2395	0.0506		-0.0225
	1.94	0.24		-1.88
3	0.0472		-0.0038	-0.0054
	0.77		-0.02	-0.94

Panel B: institutional investors

Model	β_0	β_1	β_2	β_3
1	-0.0362	-0.0302	0.0565	0.0037
	-0.75	-0.45	0.36	0.82
2	-0.0366	-0.0394		0.0036
	-0.94	-0.59		0.95
3	-0.0180		0.0273	0.0022
	-0.37		0.19	0.49

Table 6.5: Average Order Flow Imbalance During Pre-Earnings Announcement Period (continue)

Panel C: foreign investors

Model	β_0	β_1	β_2	β_3
1	-0.0991	-0.0174	0.1567	0.0096
	-0.95	-0.12	0.47	0.98
2	0.1153	0.0762		-0.0102
	1.15	0.45		-1.05
3	-0.0932		0.1402	0.0090
	-0.93		0.46	0.96

6.4. Trading during-earnings announcement period

Informed investors already trade on their private information during the pre-earnings-announcement period, therefore, they are unlikely to continue to trade during earnings-announcement and during post-earnings-announcement periods. After earnings announcement, the private information becomes public information. Uninformed investors have no more information advantages and try to learn from the earnings announcement. Therefore, they are likely to trade during earnings-announcement and during post-earnings-announcement periods. This study focuses on the average order flow imbalance (AOFI) which captures the excess trading activities during [-1, +1] window.

Similar to the pre-earnings announcement period, this study focuses on the AOFIs of individual investors, institutional investors, and foreign investors. Panel A of Table 6.6 reports the results of regression for individual investors. There is no clear trading pattern for individual

investors since β_1 and β_2 are insignificant. The results for institutional investors are reported in Panel B of Table 6.6. While β_1 is significant and positive, β_2 is significant and negative. The result implies that institutional investors have excess average order flow imbalance during the announcement period when there is positive seasonal random walk-based (RW) earnings surprise or negative analyst-based (AF) earnings surprise. Panel C of Table 6.6 reports the regression results for foreign investors. There is no clear trading pattern for foreign investors since β_1 and β_2 are insignificant. The results for all investor types are not consistent with the proposed hypothesis. Therefore, the hypothesis IV is rejected.

Table 6.6: Average Order Flow Imbalance During-Earnings Announcement Period

Panel A: individual investors

Model	β_0	β_1	β_2	β_3
1	0.0944	-0.0754	-0.3970	-0.0087
	0.9	-0.51	-1.17	-0.89
2	0.3844	0.0227		-0.0353
	2.56	0.09		-2.42
3	0.1053		-0.4560	-0.0098
	1.02		-1.46	-1.02

Table 6.6: Average Order Flow Imbalance During-Earnings Announcement Period (continue)

Panel B: institutional investors

Model	β_0	β_1	β_2	β_3
1	-0.0826	0.2271	-0.8845	0.0069
	-1.14	2.23	-3.79	1.02
2	-0.0261	0.0945		0.0018
	-0.5	1.06		0.36
3	-0.0997		-0.6639	0.0085
	-1.4		-3.07	1.27

Panel C: foreign investors

Model	β_0	β_1	β_2	β_3
1	0.0667	0.2065	-0.0327	-0.0088
	0.47	1.05	-0.07	-0.67
2	0.0257	0.1120		-0.0062
	0.19	0.5		-0.49
3	0.0429		0.1349	-0.0070
	0.32		0.33	-0.55

6.5. Trading during post-earnings announcement period

During the post-earnings announcement period, the trading patterns of informed investors and of uninformed investors are expected to be similar to ones during the announcement period. Similar to the pre-earnings announcement period and during the earnings announcement period, this study focuses on the average order flow imbalance (AOFI) which captures the excess trading activities during [+2, +45] window.

The results of regression are reported in Table 6.7. Panel A of Table 6.3 reports the regression results for individual investors. There is no clear trading pattern for individual investors since β_1 and β_2 are insignificant. The results for institutional investors are reported in Panel B of Table 6.7. While β_1 is significant and positive, β_2 is significant and negative. The result implies that institutional investors have excess average order flow imbalance during the announcement period when there is positive seasonal random walk-based (RW) earnings surprise or negative analyst-based (AF) earnings surprise. The trading patterns for institutional investors for during earnings announcement and the post-earnings announcement are similar. Panel C of Table 6.7 reports the regression results for foreign investors. While β_1 is significant and negative, β_2 is significant and positive. The result implies that foreign investors have excess average order flow imbalance during the announcement period when there is negative seasonal random walk-based (RW) earnings surprise or positive analyst-based (AF) earnings surprise. The results for all investor types are not consistent with the proposed hypothesis. Therefore, the hypothesis V is rejected.

Table 6.7: Average Order Flow Imbalance During Post-Earnings Announcement Period

Panel A: individual investors

Model	β_0	β_1	β_2	β_3
1	-0.0219	-0.0309	0.0057	0.0027
	-0.47	-0.47	0.04	0.61
2	-0.2299	-0.0666		0.0220
	-2.87	-0.49		2.82
3	-0.0253		-0.0150	0.0029
	-0.55		-0.11	0.68

Panel B: institutional investors

Model	β_0	β_1	β_2	β_3
1	-0.0445	0.1086	-0.7824	0.0043
	-1.15	1.99	-6.27	1.2
2	-0.0411	-0.0411		0.0039
	-1.27	-0.74		1.24
3	-0.0494		-0.6827	0.0048
	-1.28		-5.82	1.33

Panel C: foreign investors

Model	β_0	β_1	β_2	β_3
1	-0.0435	-0.2660	1.7911	0.0032
	-0.48	-2.1	6.16	0.38
2	0.0110	0.0230		-0.0013
	0.16	0.19		-0.19
3	-0.0200		1.5337	0.0011
	-0.23		5.76	0.14

6.6. Cumulative abnormal return during post-earnings announcement period

If uninformed investors' activities help explain the seasonal random walk-based (RW) and analyst-based (AF) earnings surprises drifts, the relations between the seasonal random walk-based (RW) and analyst-based (AF) earnings surprises drifts and the respective trading intensity by uninformed investors are expected. This study uses the cumulative abnormal return to quantify the drifts during the post-earnings announcement period, [+2, +45].

Table 6.8 reports the regression results. Model 1 includes all of the variables associated with both seasonal random walk-based (RW) and analyst-based (AF) earnings surprises. Only the coefficient of AOFI3 (β_5) is significant. β_5 is positive. It means that positive average order flow imbalance from foreign investors causes cumulative abnormal return (CAR) during post-earnings announcement period.

Model 2 includes only the variables associated with seasonal random walk-based (RW) earnings surprises. Only the coefficient of AOFI1 (β_3) is significant. β_3 is negative. It means that negative average order flow imbalance from individual investors causes cumulative abnormal return (CAR) during post-earnings announcement period. The coefficient of AOFI3 (β_5) is weaker but the sign is the same as one in Model 1.

Model 3 includes only the variables associated with analyst-based (AF) earnings surprises. The coefficients of analyst-based (AF) earnings surprise (β_2), AOFI1 (β_3), and AOFI3 (β_5) are significant. The coefficient of analyst-based (AF) earnings surprise (β_2) is positive. It means that cumulative abnormal return (CAR) is clearly observed after the positive analyst-based (AF) earnings surprise. It implies that the market underestimates the companies' performances when the positive earnings announcement is expected. The stock price is improved after the announcement. When the negative earnings announcement is expected, the

market overestimates the companies' performances. After the announcement, the stock price is decreased. The coefficients of AOFI1 (β_3) and of AOFI3 (β_5) are negative and positive, respectively. It means that cumulative abnormal return (CAR) during post-earnings announcement period is caused by negative average order flow imbalance from individual investors and positive average order flow imbalance from foreign investors. Buy-initiated transactions from foreign investors and sell-initiated transactions from individual investors cause the post-earnings announcement drifts associated with analyst-based (AF) earnings surprises. Therefore, the hypothesis VI is rejected.

6.7. Robustness check

(a) Disposition effect

Another strand of literature that provides explanation of return momentum is from behavioral aspect of investors. The disposition effect is a behavioral bias which drives return momentum. Investors with behavioral bias tend to sell their winning stocks too soon and hold on to their losing stocks too long. The disposition effect can be explained by Kahneman and Tversky's (1979) prospect theory (PT) and Thaler's (1983) mental accounting (MA). Odean (1998) and Grinblatt and Keloharju (2000) documents the disposition effect in several stock markets. Motivated by prospect theory and mental accounting, Grinblatt and Han (2005) develop a model of equilibrium asset prices which explains the link between momentum and turnover as documented in Lee and Swaminathan (2000). They propose the following model.

$$E_t\left[\frac{P_{t+1}-P_t}{P_t}\right]=(1-\omega)V_t\frac{P_t-R_t}{P_t} \qquad (11)$$

where

P_t : the stock price at time t

ω : the degree of underreaction

V_t : the stock's turnover ratio at time t

R_t : a reference price relative to which PT/MA investors measure their gains or losses

Table 6.8: Cumulative Abnormal Returns During Post-Earnings Announcement Period

Model	β_0	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9	β_{10}	β_{11}	β_{12}
1	-0.0017	-0.0003	+0.0075	-0.0034	0.0006	0.0028	0.0028	0.0199	-0.0403	0.0166	-0.0039	0.0034	0.0001
	-1.53	-0.12	+1.71	-1.98	0.31	2.60	0.06	0.54	-0.78	0.32	-0.15	0.17	1.41
2	-0.0018	-0.0013		-0.0045	0.0012	0.0017	-0.0254		-0.0336		-0.0216		0.0002
	-1.66	-0.59		-2.96	0.69	1.98	-0.62		-0.66		-0.87		1.53
3	-0.0019		+0.0078	-0.0037	0.0012	0.0029		0.0194		0.0053		-0.0004	0.0002
	-1.76		+2.07	-2.38	0.70	2.80		0.54		0.11		-0.02	1.64

The model suggests that a stock's expected return is an increasing function of the marginal investor's unrealized capital gain and current turnover. They find a significantly positive cross-sectional relation between a stock's future return and its capital gain overhang for stocks on NYSE and AMEX exchanges during July 1962 and December 1996. After controlling for the capital gain, the momentum effect disappears and the predictive power of the intermediate horizon past return becomes insignificant. Their results cannot be explained by cross-sectional differences in liquidity or the interaction of past returns and turnover.

To test whether disposition effect causes return momentum, we run pooled cross-sectional regression using the following model.

$$r_{i,t} = \alpha_0 + \alpha_1 r_{i,t-1,t-12} + \alpha_2 r_{i,t-13,t-72} + \alpha_3 \log(Size_{i,t-1}) + \alpha_4 V_{i,t-1,t-52} + \alpha_5 g_{i,t-1} \quad (12)$$

where

$r_{i,t}$: return for stock "i" on week "t".

$r_{i,t-1,t-12}$: average return for stock "i" during weeks "t-1" and "t-12".

$r_{i,t-13,t-72}$: average return for stock "i" during weeks "t-13" and "t-72".

$Size_{i,t-1}$: market capitalization in millions Baht for stock "i" on week "t-1".

$V_{i,t-1,t-52}$: average weekly turnover ratio for stock "i" during the previous 52 weeks.

$g_{i,t-1}$: capital gains overhang for stock "i" at the beginning of week t

The capital gains overhang is defined as:

$$g_{i,t-1} = \frac{(P_{i,t-2} - R_{i,t-1})}{P_{i,t-2}} \quad (13)$$

where

$P_{i,t-2}$: the price for stock "i" on week "t-2".

$R_{i,t-1}$: the reference price for stock "i"

The reference stock price is defined as:

$$R_t = \frac{\sum_{n=1}^{\infty}\left(V_{t-n}\prod_{\tau=1}^{n-1}[1-V_{t-n+\tau}]\right)P_{t-n}}{\sum_{n=1}^{\infty}\left(V_{t-n}\prod_{\tau=1}^{n-1}[1-V_{t-n+\tau}]\right)} \qquad (14)$$

The weight on price is the probability that a stock was last purchased at time t-n and has not been traded since then. The results of the regression are reported in Table 6.9. For Models 1-3, the coefficient of short-term momentum (α_3) is significant but the coefficient of long-term reversal (α_4) is insignificant when the capital gains overhang is not included in the regression model. For model 4, the coefficient of the capital gains overhang (α_5) is insignificant while the coefficient of short-term momentum (α_3) is still significant. It means that the capital gains overhang cannot predict the future weekly return.

Jegadeesh and Titman (1993), Grundy and Martin (2001), and Grinblatt and Moskowitz (2002) found seasonality on return profile. Due to the marginal impact of tax-loss selling, the disposition effect is strongest on January and weakest on December (see Odean, 1998, Grinblatt and Keloharju, 2000, and Grinblatt and Han, 2005). Models 5-6 in Table 6.9 present the results of regressions for January only, February through November only, and December only. The coefficient of the capital gains overhang (α_5) is insignificant in none of these models. This is probably due to there is no tax-loss selling benefits on SET. In summary, there is no impact of the capital gains overhang on the weekly stock returns on SET. In another word, return momentum is not caused by disposition effect.

Table 6.9: Disposition effect on return continuation

Model	Period	α_0	α_1	α_2	α_3	α_4	α_5
		0.0037	0.1785	-0.0277			
1	All	14.50	16.93	-1.35			
		0.0105	0.1811	-0.0222	-8.47E-04		
2	All	9.28	17.1	-1.08	-6.14		
		0.0096	0.1833	-0.0279	-7.69E-04	0.0040	
3	All	8.75	17.26	-1.34	-5.72	1.83	
		0.0064	0.2111	0.0191	-3.98E-04	0.0079	2.78E-04
4	All	5.50	18.81	0.93	-2.90	4.17	1.02
		0.0062	0.0822	-0.3125	7.56E-05	0.0101	-8.83E-04
5	Jan	1.60	2.81	-4.33	0.16	1.67	-1.27
		0.0077	0.2609	0.0467	-5.94E-04	0.0109	3.37E-04
6	Feb - Nov	5.83	19.79	2.01	-3.85	5.08	1.10
		-0.0056	0.0675	0.0510	8.51E-04	-0.0244	1.15E-03
	Dec	-1.70	1.80	0.82	2.20	-4.49	1.85

(b) Standardized unexpected earnings surprise (SUE), earnings announcement return (EAR), and cumulative abnormal returns (ABR)

Brandt, Kishore, Santa-Clara, and Venkatachalam (2008) find that the Earnings Announcement Return (EAR) captures the surprise in all aspects of the company's earnings announcement, not just the earnings surprise. EAR captures the market reaction to unexpected information contained in the company's earnings release. The EAR and standardized unexpected earnings surprise (SUE) strategies appear to be independent of each other. A trading strategy that combines the two signals significantly yields the abnormal returns of 12.5% per year. SUE is defined as:

$$SUE_t = \frac{[EPS_t - Forecast(EPS_t)]}{\sigma_t} \qquad (15)$$

where

ESP_t : the actual earnings per share for quarter 't'

Forecast(ESP_t): the analyst forecast earnings per share for quarter 't'

σ_t : the standard deviation of earnings surprises over the last eight quarters

While analyst-based (AF) earnings surprise is normalized by price, SUE is normalized by the standard deviation of earnings surprises. EAR is the abnormal return for firm i in quarter q recorded over a three-day window centered on the announcement date which is defined as:

$$EAR_{i,q} = \prod_{j=t-1}^{t+1}(1+r_{i,j}) - \prod_{j=t-1}^{t+1}(1+FF_{i,j}) \quad (16)$$

where

$r_{i,j}$: the return on stock i on date j surrounding the earnings announcement date

$FF_{i,j}$: the return on the benchmark size and book-to-market Fama-French portfolio to which stock i belongs.

Cumulative abnormal return (ABR) during the post-earnings announcement period [+2, +45] is defined as:

$$ABR_{i,q} = \prod_{j=t+2}^{t+45}(1+r_{i,j}) - \prod_{j=t+2}^{t+45}(1+FF_{i,j}) \quad (17)$$

The SUE, EAR, and ABR are used to test the robustness of the results of this study during the pre-earnings announcement, during-earnings announcement, and post-earnings announcement periods. Trading during pre-earnings announcement period [-7, -2] for different types of investors are re-investigated using SUE and EAR. The results are reported in Table 6.10. In general, the results are similar to ones for RW and AF, reported in Table 6.5. In summary, there

are no clear patterns of informed trading prior to earnings announcement. No investor groups have better information during the events.

Table 6.10: Average Order Flow Imbalance During Pre-Earnings Announcement Period Using Standardized Unexpected Earnings Surprise (SUE) and Earnings Announcement Return (EAR)

Panel A: individual investors

Model	β_0	β_1	β_2	β_3
1	0.0422	0.0002	-0.1273	-0.0050
	0.67	0.04	-0.50	-0.85
2	0.0431	0.0001		-0.0051
	0.69	0.02		-0.87
3	0.0461		-0.1195	-0.0053
	0.75		-0.48	-0.93

Panel B: institutional investors

Model	β_0	β_1	β_2	β_3
1	-0.0173	-0.0017	-0.0461	0.0021
	-0.35	-0.49	-0.23	0.46
2	-0.0169	-0.0017		0.0020
	-0.35	-0.50		0.45
3	-0.0180		-0.0469	0.0022
	-0.38		-0.24	0.49

Table 6.10: Average Order Flow Imbalance During Pre-Earnings Announcement Period Using Standardized Unexpected Earnings Surprise (SUE) and Earnings Announcement Return (EAR) (continue)

Panel C: foreign investors

Model	β_0	β_1	β_2	β_3
1	-0.0880	-0.0007	0.3919	0.0086
	-0.86	-0.10	0.93	0.90
2	-0.0908	-0.0004		0.0089
	-0.88	-0.06		0.93
3	-0.0881		0.3994	0.0085
	-0.88		0.97	0.91

The results of trading during-earnings announcement period [-1, +1] for different types of investors using SUE and EAR are reported in Table 6.11. For positive EAR, individual investors tend to sell while foreign investors tend to buy. The results are different from the ones using RW and AF, reported in Table 6.6, which indicates that institutional investors tend to sell for high AF. Different investor types actively trade during-earnings announcement period when different proxies of earnings surprises are used in the regression. This is probably different investor types have different ways of forming their expectations.

Trading during post-earnings announcement period [+2, +45] for different types of investors are re-investigated using SUE and EAR. The results are reported in Table 6.12. There are no clear patterns of investors trading after earnings announcement. The results are different from the ones using RW and AF, reported in Table 6.7. For high AF, individual investors tend to sell but foreign investors tend to buy. Different investor types probably have different ways of forming their expectations.

The Cumulative Abnormal Returns (CAR) are regressed against SUE and EAR. The results are reported in Table 6.13 and 6.14, respectively. The results are similar to ones for RW and AF, reported in Table 6.8. While the coefficient of average order flow imbalance for individual investors (β_2) is negative and significant, the coefficient of average order flow imbalance for foreign investors (β_4) is positive and significant. In summary, CAR is caused by the selling of individual investors and buying from foreign investors. The results imply that the earnings momentum, proxied by CAR, is driven by foreign investors.

Table 6.11: Average Order Flow Imbalance During-Earnings Announcement Period Using Standardized Unexpected Earnings Surprise (SUE) and Earnings Announcement Return (EAR)

Panel A: individual investors

Model	β_0	β_1	β_2	β_3
1	0.1174	-0.0062	-1.1720	-0.0112
	1.14	-0.86	-2.79	-1.17
2	0.1256	-0.0071		-0.0121
	1.21	-0.97		-1.24
3	0.0897		-1.2014	-0.0083
	0.88		-2.87	-0.87

Panel B: institutional investors

Model	β_0	β_1	β_2	β_3
1	-0.1112	0.0039	0.3433	0.0093
	-1.60	0.81	1.21	1.44
2	-0.1136	0.0042		0.0095
	-1.64	0.86		1.48
3	-0.1136		0.0042	0.0095
	-1.64		0.86	1.48

Table 6.11: Average Order Flow Imbalance During-Earnings Announcement Period Using Standardized Unexpected Earnings Surprise (SUE) and Earnings Announcement Return (EAR) (continue)

Panel C: foreign investors

Model	β_0	β_1	β_2	β_3
1	0.0597	0.0092	3.6673	-0.0084
	0.46	1.02	6.95	-0.70
2	0.0339	0.0120		-0.0058
	0.25	1.24		-0.45
3	0.0339		0.0120	-0.0058
	0.25		1.24	-0.45

Table 6.12: Average Order Flow Imbalance During Post-Earnings Announcement Period Using Standardized Unexpected Earnings Surprise (SUE) and Earnings Announcement Return (EAR)

Panel A: individual investors

Model	β_0	β_1	β_2	β_3
1	-0.0171	-0.0028	-0.2614	0.0020
	-0.37	-0.87	-1.38	0.48
2	-0.0152	-0.0030		0.0019
	-0.33	-0.93		0.44
3	-0.0272		-0.2107	0.0031
	-0.59		-1.12	0.72

Table 6.12: Average Order Flow Imbalance During Post-Earnings Announcement Period Using Standardized Unexpected Earnings Surprise (SUE) and Earnings Announcement Return (EAR) (continue)

Panel B: institutional investors

Model	β_0	β_1	β_2	β_3
1	-0.0586	0.0013	0.0705	0.0057
	-1.41	0.45	0.41	1.46
2	-0.0591	0.0013		0.0057
	-1.42	0.47		1.48
3	-0.0569		0.0621	0.0055
	-1.40		0.37	1.46

Panel C: foreign investors

Model	β_0	β_1	β_2	β_3
1	-0.0011	0.0024	0.1864	-0.0006
	-0.01	0.37	0.48	-0.07
2	-0.0024	0.0025		-0.0005
	-0.03	0.39		-0.06
3	-0.0004		0.1722	-0.0007
	-0.01		0.46	-0.09

Table 6.13: Cumulative Abnormal Returns (CAR) During Post-Earnings Announcement Period Using Standardized Unexpected Earnings Surprise (SUE)

Model	β_0	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8
1	-0.0019	0.0001	-0.0043	0.0019	0.0020	-0.0003	-0.0005	-0.0002	0.0002
	-1.70	1.33	-2.86	1.09	2.28	-0.35	-0.50	-0.44	1.59

Table 6.14: Cumulative Abnormal Returns (CAR) During Post-Earnings Announcement Period Using Earnings Announcement Return (EAR)

Model	β_0	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8
1	-0.0021	-0.0068	-0.0041	0.0017	0.0024	0.0381	0.0035	0.0378	0.0001
	-2.02	-1.54	-2.76	1.05	2.70	0.75	0.05	1.10	1.89

Table 6.15 reports the regression results of ABR during the post-earnings announcement period. ABR is caused by selling from individual investors (β_3 =-0.1537), buying from both institutional investors (β_4 =0.1655) and foreign investors (β_5 =0.1723). The results are slightly different from ones for CAR, reported in Table 6.8. The results imply that the earnings momentum, proxied by ABR, is driven by institutional investors and foreign investors. For CAR, the trading from institutional investors do not cause CAR. In addition, the interaction terms between AF and investors trading have an effect on ABR since β_7, β_9, and β_{11} are significant and positive. ABR is clearly observed when AF is positive and there are abnormal buys from any investor types, vice versa. These interaction effects are not observed for CAR.

Table 6.16 reports the regression results when RW and AF are replaced by SUE. ABR is clearly observed when SUE is positive, (β_1 =0.0061). ABR is caused by selling from individual investors (β_2 =-0.1800), buying from both institutional investors (β_4 =0.1505) and foreign

investors (β_5 =0.1443). The results are similar to ones which use RW and AF, reported in Table 6.15. However, the interactions between SUE and investors trading have no effect on ABR. The results imply that the earnings momentum, proxied by ABR, is driven by institutional investors and foreign investors.

Table 6.17 reports the regression results when RW and AF are replaced by EAR. EAR around earnings announcement have no effect on ABR since β_1 is insignificant. The effects of investors trading on ABR remain the same when SUE is replace by EAR. In summary, the earnings momentum, proxied by ABR, is driven by institutional investors and foreign investors.

Table 6.15: Cumulative Abnormal Returns (ABR) During Post-Earnings Announcement Period

Model	β_0	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9	β_{10}	β_{11}	β_{12}
1	-0.0456	0.0861	-0.1764	-0.1537	0.1655	0.1723	0.2293	2.5441	-0.9800	3.6056	1.0305	1.3200	0.0048
	-1.19	1.10	-1.16	-2.61	2.54	4.58	0.15	2.00	-0.55	2.03	1.12	1.91	1.36
2	-0.0516	0.0852		-0.1974	0.1717	0.1354	-0.3817		-0.4952		0.8228		0.0053
	-1.34	1.13		-3.70	2.74	4.40	-0.27		-0.28		0.95		1.49
3	-0.0499		-0.1305	-0.1561	0.1641	0.1631		2.6278		4.0198		1.5017	0.0051
	-1.36		-1.01	-2.87	2.69	4.57		2.12		2.38		2.28	1.51

Table 6.16: Cumulative Abnormal Returns (ABR) During Post-Earnings Announcement Period Using Standardized Unexpected Earnings Surprise (SUE)

Model	β_0	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8
1	-0.0423	0.0061	-0.1800	0.1505	0.1443	0.0231	-0.0078	0.0256	0.0045
	-1.14	2.36	-3.54	2.53	4.77	0.79	-0.22	1.37	1.32

Table 6.17: Cumulative Abnormal Returns (ABR) During Post-Earnings Announcement Period Using Earnings Announcement Return (EAR)

Model	β_0	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8
1	-0.0597	0.1636	-0.1680	0.1487	0.1503	2.2104	0.0676	1.8266	0.0060
	-1.62	1.05	-3.24	2.51	4.78	1.24	0.03	1.53	1.75

6.8. Policy implication

The results in the previous sections clearly illustrate that institutional investors and foreign investors cause both price momentum and earnings momentum. The empirical evidences imply that individual investors are more informed than institutional investors and foreign investors. The results are probably due to the levels of investor protection and stock price informativeness in Thailand which are relatively low, compared to U.K. and U.S.A. Inside trading normally takes place in such a market.

When one investor group knows more than other investor groups, the unfair trading is expected. Foreign investors are rational and global investors. They should be aware that they are uninformed investors. Because of information disadvantages, they could not have

competitive advantages, regardless of their superior skills and knowledge. Therefore, they are likely to be short-term speculators, not long-term investors.

Speculators are not preferred and unavoidable in any stock markets. They make the market unstable. SET is sensitive to the moving of foreign funds. It is apparently that SET returns are closed related to net-buys from foreign investors. The stability the stock market can be improved by increasing the fraction of long-term investors and decreasing the fraction of short-term speculators. The differences of informed trading across the investor groups must be reduced. It is the role of the Securities and Exchange Commission (SEC) to promote investor protection and stock price informativeness on SET. The policy should minimize inside trading and improve the transparency of the companies on SET.

Chapter VII

Summary

This study investigates information asymmetry associated with return momentum and earnings momentum using data on SET during 1999 to 2007. The unique SET data provides transactions by different investor groups on an emerging market. Therefore, we do not need to use trade size as a proxy for investor type. This study tries to answer the following momentum puzzles:

I. Return momentum:
   - what causes return momentum
   - who causes return momentum

II. Earnings momentum:
   a. First, this study investigates trading activities from different investor groups during three periods around earnings announcement:
      - pre-earnings-announcement period,
      - during earnings-announcement period, and
      - post-earnings-announcement period.
   b. Second, this study examines the post-earnings-announcement drift (PEAD) which is one of the longest-standing anomalies. This study tries to find out who cause PEAD.

Using several proxies for information asymmetry, this study finds a strong cross-sectional relationship between return momentum and informed trading. In particular, stocks with high turnover exhibit return momentum under information asymmetry and exhibit return reversal under information symmetry. The results are consistent with Wang's (1994) predictions. Information asymmetry is the major source of return momentum, not uncertainty, liquidity, or disposition effect. The results show that foreign investors and local institutional investors cause return momentum. Under Wang's (1994) model, the local individual investors are more informed than foreign investors and local institutional investors.

This study finds that these are no investor groups which have clear trading patterns prior to earnings announcement. It implies that no investor groups have private information prior to the earnings announcement. During the earnings announcement, only institutional investors have excess average order flow imbalance when there is positive seasonal random walk-based (RW) earnings surprise or negative analyst-based (AF) earnings surprise. During the post-earnings announcement period, institutional investors have excess average order flow imbalance when there is positive seasonal random walk-based (RW) earnings surprise or negative analyst-based (AF) earnings surprise. Foreign investors have excess average order flow imbalance when there is negative seasonal random walk-based (RW) earnings surprise or positive analyst-based (AF) earnings surprise. Cumulative abnormal return (CAR) is clearly observed after the positive analyst-based (AF) earnings surprise. Buy-initiated transactions from foreign investors and sell-initiated transactions from individual investors cause the post-earnings announcement drifts associated with analyst-based (AF) earnings surprises.

This study contributes to the financial literature by providing clear evidences about return momentum and earnings momentum on SET, an emerging market. First, the source of return momentum is clearly identified on a market with low investor protection. In addition, this study directly investigates the impact of investors trading on return profiles. This information helps us understand who cause momentum effect and who are more informed. Second, this study provides clear evidences about investor trading around earnings announcement. This information helps us understand who cause Post Earnings Announcement Drift (PEAD) momentum effect and who uninformed investors are.

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Biography

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