# The Relationship between Information Asymmetry and Abnormal Returns: A Study of Individual Investors and Institutional Investors

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## Abstract

The information asymmetry exists in stock market because individual investors are usually less capable of obtaining information from listed companies than institutional investors. In general, if institutional investors held a large share in one company, the disclosure should be better. In this study, our sample is grouped by the share ratio of individual investors and institutional investors, and we exam the relationship between abnormal returns and information asymmetry in a different group. We also exam the correlation among information asymmetry, market return, and turnover. This paper adopts VAR and other models to exam the listed stock market samples in Taiwan from 2006 to 2019. Empirical results are as follows: (1) the stock market in Taiwan exist long-run and short-run abnormal returns; (2) the abnormal returns are not significantly different between a company with a large share of individual investors and a company with a large share of institutional investors; (3) when the stocks with significant changes in shareholdings, their long-run abnormal returns will significantly greater than the short-run abnormal returns,; (4) by considering the factors affecting information asymmetry during shocks, turnover is the major factor, market returns the second, and the shareholding of institutional investors and individual investors the last; abnormal returns effect is not sure. In addition to the shareholding of institutional investors and individual investors, all factors link to the information asymmetry have positive correlations.

Keywords: information asymmetry, abnormal return, individual investors, institutional investors

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## 1. Introduction

Asymmetric information will lead to inefficient for stock pricing. Akerlof (1970) explores the lemon market, noted that asymmetric information exists in the market, and investors will lose their confidence, and underestimating the true value, final will lead to the adverse selection. Ofer and Thakor (1987) indicated that if the market exists information asymmetry, the investors in the stock market will overreact to stock prices. Botosan (1997) pointed out that the deeper information disclosure, the more favorable it is to raise funds, which can obtain lower capital costs and increase profit opportunities. Lobo and Tung (1997) indicated that if the degree of information asymmetry is higher, then the transaction volume will become larger, and there exists a significant positive correlation between these two variables. Heflin *et al.* (2005) noted that companies with higher degree of information transparency, will have lower volatility, higher stock liquidity, and, higher value. Wang and Zhang (2006) pointed out that the abnormal return and the degree of information asymmetry will have a positive correlation. The power of individual investors and institutional investors to gain information is different, and there exists information asymmetry in the Taiwan stock market. Hence, this study examines the relationship between abnormal returns and information asymmetry.

Lee and Swaminathan (2000) organized a momentum portfolio by turnover and return and proposed a momentum cycle. Its research results show that losers with low liquidity before the event will reverse and become winners after the event; winners with low liquidity before the event will have price persistence after the event. Winners with high liquidity before the event will have a reversal phenomenon after the event; losers with high liquidity before the event will continue to fall in stock prices after the event, hence liquidity will be an important factor to momentum. Covring *et al.* (2006) pointed out that there is a positive correlation between information disclosure and company size; while stocks with higher liquidity are traded more frequently and liquidity risks are lower. Hong *et al*. (2007) examined the momentum phenomenon in the Taiwan stock market, they found that a momentum investment portfolio formed by a 6-month formation period, will have the largest cumulative excess return if the holding period was 12 months, but when the holding period larger than 12 months, the rate of return showed a diminishing phenomenon, showing that the stock market has different effects of short-term and long-term momentum. Hence, this study explores the relationship between liquidity and information asymmetry, and to test whether its short-term and long-term effects are different.

Gu *et at.*, (2015) explores the momentum in the Taiwan stock market and noted that there exists different return, in which the momentum is formed by fluctuation and value at risk. Gu (2010) explores the momentum of revenue in the Taiwan stock market. The momentum portfolios of winners and losers were formed by standardized unexpected revenue. He found that the momentum portfolio of 1 to 12 months will have significant returns, and there is a

significant correlation between the earnings momentum and revenue momentum. The above research mainly discusses the internal influencing factors of the momentum phenomenon, and the influencing factors may also come from the outside. Therefore, this study examined the relationship between external factors and information asymmetry.

Easley and O'Hara (1987) consider that if the securities market is perfectly competitive, then the transactions will follow the Poisson distribution. When there are more transactions with superior information, the degree of information asymmetry may be greater. Therefore, this study applied the probability of informed trading (PIN) model to estimate information asymmetry. But, Easley *et al.* (2008) consider that the PIN model exists the problem that will not easy to converge, this reduces the effectiveness of the sample. Therefore, we choose the adjusted logarithmic transformation model constructed by (Aktas *et al.*, 2007) to assess the information asymmetry, and the transaction is driven by buyers or sellers to estimate the probability of superior information transaction.

The transparency of information has always been criticized in the stock market, and it will also affect market efficiency, which may result in abnormal returns. The difference between individual investors and institutional investors information may gradually decrease over time, hence short-term and long-term effects are observed at the same time. The results are as follows: (1) the stock market in Taiwan exist long-run and short-run abnormal returns; (2) the abnormal returns are not significantly different between a company with a large share of individual investors and a company with a large share of institutional investors; (3) for the company changes in the ratio of shareholdings significantly, their abnormal returns in the long-term are significantly larger than the abnormal returns in short-term,; (4) by considering the information asymmetry factors, the turnover is the major factor, the market returns is the second factor, and the abnormal returns is the last factor. All factors have positive correlations with the information asymmetry.

## 2. Literature Review

### *2.1. Irrational investors*

Kumar and Lee (2006) proved that small-scale, value stocks, holdings of lower institutional investors, and low-priced stocks are stocks that are more concentratedly traded by individual investors. Moreover, among these individual stocks where individual investors are more concentrated transactions and stock returns move in the same direction. Barber and Odean (2000) conducted another study on the phenomenon of overconfidence of individual investors from 1991 to 1996. They wanted to understand whether the transaction cost of investors who traded too frequently would greatly erode the return of investment, which confirmed the phenomenon of investor overconfidence. The research results show that for investors who trade more frequently, the average return is 11.9%, while for investors who trade less frequently, the

average return is 18.5%, and the average return of all investors is also higher than 11.9%, reaching 17.9%. In terms of the whole question, excessively frequent transactions will affect the return on investment. Barber *et al.* (2009) consider that individual investors who actively buy will have worse returns in the next year than those they actively sell. This situation will last 3-4 weeks.

De Bondt *et at.* (1985) pointed out that people usually overestimate the correctness of their judgments. Weinstein (1980) studied the phenomenon of overconfidence and found that when people think that the results can be controlled, they will have overconfidence in the decision-making. Shefrin and Statman (1994) believe that investors often make wrong investments because of overconfidence because they do not know that their information is insufficient. Odean (1998) found that investors with overconfidence will overreact the market price because of too frequent transactions, but the market price will be revised back afterward. Therefore, information overreaction and price reversal can lead to negative growth in long-term returns. Chuang and Lee (2006) verify investor overconfidence and found four characteristics in the New York stock market: (1) Overconfident investors underreact to the information in public, but overreact to the information in private. (2) When investors make a profit, they will trade more aggressively in the next period. (3) Stock prices will be excessively volatile due to overconfidence investors' over-trading. (4) When investors are overconfident, they will easy to underestimate risks and buy more risky stocks.

### *2.2. Abnormal Return*

Fama (1970) proposed an efficient market and believed that investors are rational and the market is efficient. Even if some investors behave irrationally, rational prices can be restored through the arbitrage mechanism. Therefore, no one in an efficient market can Beat the market. However, later research found that certain abnormal returns exist in the market, so market investors are not completely rational. Jegadeesh and Titman (1993) exam the U.S. stock market, classified stocks as winners and losers in order of return, and constructed a momentum portfolio (buying winners, selling losers), and found that the momentum portfolio had significant excess returns in the first year. Chan *et al*. (1996) examined the momentum phenomenon in the US stock market and show that price momentum strategies have excess returns; the excess returns of momentum constructed by earnings will be different. Fama (1998) noted that the momentum cannot be interpreted by the three-factor model. Therefore, the efficient market hypothesis has been shocked, and there exist an abnormal return of price and earnings momentum. Conrad and Kaul (1998) verified that the profit of momentum is created by the variation of the expected return, rather than the overreaction or underreaction of investors. Rouwenhorst (1998) examined the stock markets of European countries and found that there is a phenomenon of momentum. Hong and Stein (1999) consider that the psychological bias of investors lead to

excess returns in momentum portfolios. Because investors do not fully respond to information, momentum is generated. Moskowitz and Grinblatt (1999) believe that industrial risk is the main factor of momentum. Berk *et al.* (1999) consider that the profit of momentum is owing to the risk and the cross-sectional variation of expected returns.

Jegadeesh and Titman (2001) examined the US stock market momentum from 1965 to 1998. He found that after 90 years, there will still exist abnormal returns, and the winners will reverse and become losers afterward. Lee and Swaminathan (2000) formed a momentum portfolio by turnover and return, and obtained the following results: Winners with low trading volume beforehand will have prices continue to rise; losers with low trading volume beforehand will reverse and become winners afterwards. A loser with a high transaction volume beforehand will continue to fall in price; a winner with a high transaction volume beforehand will reverse and become a loser afterward. Lewellen (2002) consider that the profit of momentum depends on cross-correlation, self-correlation, and cross-sectional difference of returns. Chordia and Shivakumar (2002) show that the factor of momentum includes the overall economy and prosperity causes. Scott *et al.* (2003) verified that besides the US market, the phenomenon of momentum formed by earnings also appear in the other world stock markets for example France, Germany, Britain, and Japan. Hong *et al*. (2003) examined the momentum phenomenon of stock markets in 11 different countries and found that earnings momentum and price momentum may exist simultaneously. Cooper *et al.* (2004) consider that the profitability of momentum may come from the long-short state of the stock market. Griffin *et al*. (2005) examined the stock market momentum in 34 countries, they found that exist earning momentum in 27 countries. Jegadeesh and Livnat (2006) studied the influencing factors of momentum compensation and found that the impact of unexpected earnings is greater than the impact of unexpected revenue. Based on the above research, the source of abnormal return for momentum strategies has not yet reached a consistent conclusion, so it is worthy of further discussion.

### *2.3. Information asymmetry*

Ross (1977) pointed out that when insider information is better than outsider information, managers will release information about the company's value to increase remuneration; when insider information is equivalent to outsider information, managers are less willing to manage earnings. Akerlof (1970) put forward the lemon market argument that if there is information asymmetry, investors are easy to adverse selection, and then lose their confidence, and the true value will be underestimated. Ofer and Thakor (1987) found that there is a problem of information asymmetry, which will cause investors to overreact to stock prices, which will cause the stock market to crash. If there is no problem of information asymmetry, stock prices will have a more reasonable evaluation. Lobo and Tung (1997) pointed out that if the degree of information asymmetry becomes larger, then the transaction volume also will become larger,

indicating that these two variables have a significant positive correlation. Duru and Reeb (2002) believe that the accounting standards for overseas investment in the United States are not comprehensive enough, and exist information asymmetry between investors and managers, which reduces the accuracy of forecasts.

Bloomfield and Wilks (2000) consider that a market with larger information transparency will have larger liquidity. If the information transparency increases, then risks, and uncertainties will decrease, and the bid-ask spread will decrease, which will increase liquidity and increase stock returns. Bloomfield and O'Hara (1999) pointed out that the information transparency degree will affect market efficiency, volatility, and liquidity. Chen *et al.* (2003) found that the company size and the repurchase of stock change in the opposite direction, and the repurchase of stock and the information asymmetry degree change in the same direction. Gul and Leung (2004) noted that information disclosure major depends on liquidity. Wang and Zhang (2006) indicated that information asymmetry degree and abnormal returns will change in the same way. The greater the degree of information asymmetry, the greater the difference between investors' assessment of the company's future value and the more significant stock abnormal returns.

Duarte and Young (2009) used the PIN mode as a proxy variable for informed transactions. And, PIN is regarded as a dependent variable to estimate information asymmetry. De Cesari and Huang-Meier (2015) pointed out that abnormal returns have a significant positive effect on futures contracts. They used PIN to measure information asymmetry and found that futures contracts have a high degree of information asymmetry. Heitzman and Klasa (2017) explored the investor's response to newly generated private information, using PIN to test whether the abnormal return near the date when the private information was generated are affected by information asymmetry. Brennan *et al*. (2018) used the PIN model to explore the difference in stock return between informative traders and uninformed traders before and after the company's announcement regarding the purchase of a merged company. Bosque *et al*. (2020) pointed out that the PIN model is the most popular model for measuring information asymmetry. The theoretical basis of the PIN model is widely used in the study of measuring insider trading.

## 3. Methodology

### *3.1 Variable*

#### *3.1.1 Abnormal Return*

This paper applies the market model to estimate abnormal return. Its advantage is that it can eliminate market effect and account the company-character information effect within the error term. The model is as follows:

$$R_{it} = a_i + b_i * R_{mt} + \varepsilon_{it}, \quad (1)$$

where $R_{it}$ denote the stock return of company i in period t, $R_{mt}$ is the stock index return in period t, and $\varepsilon_{it}$ is the error term, $\varepsilon_{it}$~N(0, $\sigma^2$).

$AR_i$ = actually return - $\hat{R}_{it}$, (2)

where $\hat{R}_{it}$ is the estimator of $R_{it}$, $AR_i$ is the Abnormal Return.

$CAR_i(1, T)=\sum_{t=1}^{t=T} AR_{it}$, (3)

where CARi(1, T) denote the cumulative abnormal return of company i in the period (1, T) after the event date.

The estimated period of abnormal return is 100 trading days before the event date. The event day is the trading day when the information asymmetry indicator PIN is not 0.

### *3.1.2 Information Asymmetric*

This paper chooses the advantage of information trading probability (PIN) to estimate the information asymmetry. Easley and O'Hara (1987) pointed out that if the securities trading market is perfectly competitive, then the probability of information trading will follow the Poisson distribution. The larger of superior information trading probability, the higher information asymmetry degree. However, Easley *et al*. (2008) consider that the PIN model exists non-convergence of the solution function, which will reduce the effectiveness of the sample. Therefore, we applied the model of (Aktas *et al*., 2007) to measure the logarithmic transformation of the model, and the probability of superior information transaction by buyer-driven or seller-driven. Seller-driven is the transaction price less than the average price. Buyer-driven is the transaction price larger than the average price. The model is as follows:

$$PIN = \frac{E(|B-S|)}{E(|B+S|)}, \quad (4)$$

where E is the expected value function, B denote the number of buyer-driven transactions, and S denote the number of seller-driven transactions. The total number of buyer-seller-driven transactions (B+S) is the denominator, the buyer-seller-driven transaction difference (B-S) is the numerator, and PIN is the information transaction probability of each company every day.

### *3.2 The Hypothesis*

This paper examines the correlation between abnormal returns, information asymmetry, and, liquidity.

***Hypothesis 1: There exist abnormal returns in the short-term and long-term for the Taiwan stock market.***

**Short-term abnormal return**

$H_0$: $AR_t = 0$

$H_1$: $AR_t \neq 0$

We use t-test statistics to exam the significance of the abnormal return of each company. First, we test the abnormal returns of standard deviation in date t, and T is the test statistic.

$$t^{AR} = \frac{AR_t}{\sqrt{S^2(AR_t)}}, \quad (5)$$

where $AR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{it}$, $S^2(AR_t) = \frac{1}{T-1}\sum_{t=t_1}^{t_2}(AR_t - \sum_{t=t_1}^{t_2}\frac{AR_t}{T})^2$, T=$t_2$-$t_1$+1 and $t_1$ is the first day; $t_2$ is the final day.

**Long-term abnormal return**

$H_0$: $ACAR_T = 0$

$H_1$: $ACAR_T \neq 0$

Where ACAR is the average of CAR. We apply the "Wilcoxon Sign Rank Test" to exam the significance of cumulative abnormal return.

***Hypothesis 2: The abnormal returns of companies with a larger share of individual investors are significantly higher than those of companies with a larger share of institutional investors, whether in the short-term or the long-term.***

**Short-term (different shareholdings' abnormal returns)**

$H_0$: $AAR_T$ (individual investors with high shareholdings)－$AAR_T$ (institutional investors with high shareholdings) > 0

$H_1$: $AAR_T$ (individual investors with high shareholdings)－$AAR_T$ (institutional investors with high shareholdings) = 0

Where AAR denote the average of AR.

**Long-term (different shareholdings' abnormal returns)**

$H_0$: $ACAR_T$ (individual investors with high shareholdings)－$ACAR_T$ (institutional investors with high shareholdings) > 0

$H_1$: $ACAR_T$ (individual investors with high shareholdings)－$ACAR_T$ (institutional investors with high shareholdings) = 0

Where ACAR denote the average of CAR.

Individual investors with high shareholdings: first 30% of which companies with a higher proportion of individual investors. Institutional investors with high shareholdings: first 30% of which companies with a higher proportion of institutional investors.

***Hypothesis 3: If the proportion of shareholdings by individual investors and institutional investors changes significantly in the short-term and long-term, then there will exist a significant difference of abnormal return between the short-term and long-term.***

$H_0$: $AR_L = AR_S$

$H_1$: $AR_L \neq AR_S$

Where $AR_S$ denote the abnormal return in short-term; $AR_L$ denote the abnormal return in long-term.

Based on the average ranking of [long-term shareholding ratio of institutional (individual) investors-short-term shareholding ratio of institutional (individual) investors], the top 1/3 are selected as samples with significant changes in the long-term and short-term shareholding ratios, long-term 60 days, short-term 20 days.

***Hypothesis 4: The main factors of information asymmetry.***

$$PIN_{i,t} = a + a_1 * AR_{i,t-1} + a_2 * Turnover_{i,t-1} + a_3 * INDEX_{i,t-1} + a_4 * RATIO_{i,t-1} + Z_{i,t}, \quad (6)$$

The $AR_{i,t-1}$ denote the abnormal return of company i in date t-1. The INDEXi,t-1 denote the return of the stock market in date t-1, and this is used to measure the business cycle. The $PIN_{i,t}$ denote the Probability of Informed Trading, and this is used to estimate the information asymmetric of the company i in date t. The $Turnover_{i,t-1}$ is the turnover of the company i in date t-1, this variable is used to estimate the liquidity. RATIOi,t-1 is (the shareholdings of institutional investors/ the shareholdings of individual investor) of the company i in date t-1. When the shareholding of institutional investors increases then the RATIO will increase; when the shareholding of individual investors increases then the RATIO will decrease.

If the coefficient $a_1$ is significantly larger than 0, then the abnormal returns and information asymmetry will change in the same way Similarly, the coefficient $a_2$ is used to exam the relationship between liquidity and information asymmetry, the coefficient $a_3$ is used to exam the relationship between business cycle and information asymmetry, the coefficient $a_4$ this variable is used to distinguish the information asymmetry effect between of institutional investors and individual investor.

### *3.3 Model*

#### *3.3.1 VAR*

The vector autoregression model VAR (Sims, 1980) is constructed as follows:

$$y_t = \alpha + \sum_{i=1}^{p} \beta_i y_{t-i} + \varepsilon_t, \quad E(\varepsilon_t) = 0, \quad (7)$$

where $y_t$ is a vector in date t, $y_{t-i}$ is a vector in date t-i, $E(\varepsilon t * \varepsilon s) = \Sigma \neq 0$ , $E(\varepsilon t * \varepsilon s) = 0$, $\beta_i$(i=1,⋯, p) use to measure the relationship between $y_t$ and $y_{t-i}$. By testing the significant positive or

negative of the coefficient i (i=1,⋯,p), the relationship between the lagging period of the explanatory variable and the explained variable can be determined.

### *3.3.2 The Granger Causality*

We used Granger Causality to test the relationship between leading and lagging variables. When adding new variables to the time series data, Granger causality can be used to test whether the addition of the new variable will reduce the forecast error to improve the forecasting ability. Granger (1969) explored the possible influence and direction of the equilibrium relationship between variables from the perspective of predictive ability, and developed a pair of variable regression equations, as follows:

$$M_t = a_0 + \sum_{i=1}^{p} a1_i M_{t-i} + \sum_{i=1}^{p} a2_i N_{t-i} + \varepsilon_t, \quad (8)$$

$$N_t = b_0 + \sum_{i=1}^{p} b1_i M_{t-i} + \sum_{i=1}^{p} b2_i N_{t-i} + \varepsilon_t, \quad (9)$$

where $M_t$ and $N_t$ are two time-series variables; $a_0$ and $b_0$ are intercepts; $\varepsilon_t$ and $\omega_t$ are white noises.

We use F test to exam the hypothesis:

$H_0$ ： $a2_1 = a2_2 = \ldots = a2_p = 0$

$H_1$ ： $b1_1 = b1_2 = \ldots = b1_p = 0$

If it rejects null hypothesis $H_0$, then $N_t$ influences $M_t$. Similarly, if the alternative hypothesis $H_1$ is rejected, it means that $M_t$ influences $N_t$. If it is impossible to reject both $H_0$ and $H_1$, it indicates that there is no causal relationship between $M_t$ and $N_t$. If both $H_0$ and $H_1$ are rejected at the same time, it indicates that $M_t$ and $N_t$ are mutually causal.

### *3.3.3 Impulse Response Analysis*

When there is a shock to variables in the VAR model, the Impulse Response Function (Sims, 1980) can be applied to measure the effect of inter-period shocks among various variables, as well as the number of periods affected by the shock to last in the future. By converting the above causality equation into MA (moving average) mode using World Decomposition Theorem, then each variable will be compatible with the random impact term of each lagging period expressed as the following equation, which can be regarded as the linear combination of the errors of all endogenous variables:

$$y_t = \alpha + \sum_{i=1}^{p} \lambda_i \varepsilon_{t-1}. \quad (10)$$

If $\varepsilon_t$ is independent, we can do the decomposition of the predicted variance, and compute the percentage affected by the variance. Also, to avoid the correlation between the forecasted errors and the current period, the orthogonalization process can be used to remove the current period correlation. The above equation can be transformed into the following equation:

$$x_t = \alpha + \sum_{i=1}^{p} T_i \omega_{t-1}. \quad (11)$$

To evaluate the impact of a variable on the changes of other endogenous variables when spontaneous interference occurs, the prediction error variance of each variable and the degree to which it is explained by its changes and other variables can be measured by estimating the error variance decomposition through the k-th order prediction error of yt.

## 4. Empirical Results

Our data include the listed component stocks of the Taiwan 50 Index, it is constructed by 50 companies with the largest market value in Taiwan. And include Taiwan Mid-Cap 100 Indexes, it is formed by 100 companies with the 51st to 150th market value. The combined market share of Taiwan 50 and Mid-Cap Index 100 is approximately 90%. The data start from September 1, 2006, to October 1, 2019, with a total number of 3236 trading days and the total number of firms is 150. The data is followed by the Taiwan Economic Journal (TEJ) database.

***Hypothesis 1: There exist abnormal returns in the short-term and long-term for the Taiwan stock market.***

Table 1 The test of abnormal return in short-term and long-term

| **Panel A (the abnormal return for time average)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Test of Mean** | | | | **Test of Median** | | | |
| | **AR (1)** | **CAR (20)** | **CAR (60)** | | **AR (1)** | **CAR (20)** | **CAR (60)** |
| Average | 0.0393 | 0.7923 | 2.3548 | Median | 0.0348 | 0.7116 | 2.0622 |
| t-statistic | 7.2397 | 12.6379 | 12.6377 | Wilcoxon | 7.3715 | 7.3865 | 7.4114 |
| Probability | 0.0000*** | 0.0000*** | 0.0000*** | Probability | 0.0000*** | 0.0000*** | 0.0000*** |
| **Panel B (the abnormal return for stock average)** | | | | | | | |
| **Test of Mean** | | | | **Test of Median** | | | |
| | **AR (1)** | **CAR (20)** | **CAR (60)** | | **AR (1)** | **CAR (20)** | **CAR (60)** |
| Average | 0.0392 | 0.7922 | 2.3547 | Median | 0.0447 | 0.6896 | 2.0097 |
| t-statistic | 7.2397 | 33.7726 | 56.1948 | Wilcoxon | 7.6130 | 29.6316 | 42.1722 |
| Probability | 0.0000*** | 0.0000*** | 0.0000*** | Probability | 0.0000*** | 0.0000*** | 0.0000*** |

Note:
1. period (2006/9-2019/10), the number of time serial samples are 3236 in Panel A, the number of stock samples is 150 in Panel B.
2. The AR is Abnormal Return; the CAR is Cumulative Abnormal Return; in ( ) is the period
3. ***, **, and * denote significance within 1%, 5%, and 10% levels, respectively.

By Table 1, we found that regardless of the abnormal returns of 1, 20, or 60 days, the abnormal returns are significantly greater than 0, in the cross-sectional average and median test. And the significance level is better than 1%. Therefore, we can infer that the Taiwan 50 and Taiwan Mid-Cap 100 index stocks may have positive abnormal returns during the sample observation period.

***Hypothesis 2: The abnormal returns of companies with a larger share of individual investors are significantly higher than those of companies with a larger share of institutional investors, whether in the short-term or the long-term.***

Table 2 Compare the abnormal return between the company with larger individual investors and larger institutional investors

**Panel A (the abnormal return for time average)**

| **Mean(individual)-Mean(institutional)** | | | | **Median(individual)-Median(institutional)** | | | |
|---|---|---|---|---|---|---|---|
| | **AR (1)** | **CAR (20)** | **CAR (60)** | | **AR (1)** | **CAR (20)** | **CAR (60)** |
| Average | 0.0005 | 0.0241 | -0.0083 | Median | -0.0013 | -0.0463 | -0.3645 |
| t-statistic | 0.0715 | 0.1510 | -0.0172 | Wilcoxon | 0.0762 | 0.1016 | 0.0508 |
| Probability | 0.9436 | 0.8812 | 0.9864 | Probability | 0.9393 | 0.9191 | 0.9595 |

**Panel B (the abnormal return for stock average)**

| **Mean(individual)-Mean(institutional)** | | | | **Median(individual)-Median(institutional)** | | | |
|---|---|---|---|---|---|---|---|
| | **AR (1)** | **CAR (20)** | **CAR (60)** | | **AR (1)** | **CAR (20)** | **CAR (60)** |
| Average | 0.0005 | 0.0243 | -0.0083 | Median | 0.0013 | -0.1560 | -0.0928 |
| t-statistic | 0.0571 | 0.4980 | -0.1008 | Wilcoxon | 0.0176 | 0.5292 | 0.2873 |
| Probability | 0.9545 | 0.6185 | 0.9197 | Probability | 0.9859 | 0.1262 | 0.7739 |

Note:
1. Individual: first 30% of which companies with a higher proportion of individual investors, number of samples=26; Institutional: first 30% of which companies with a higher proportion of institutional investors, number of samples=26.
2. AR=Abnormal Return; CAR=Cumulative Abnormal Return; in ( ) is the period
3. ***, **, and * denote significance within 1%, 5%, and 10% levels, respectively.

By Table 2, it is found that the abnormal returns, regardless of the period 1, 20, or 60 days, are tested in average and median. The abnormal return of a larger share of individual investors and the abnormal return of a larger share of institutional investors are not significantly different from 0. Hence, we consider that the difference is insignificant between the abnormal returns with a larger share of individual investors and the abnormal return with a larger share of institutional investors.

***Hypothesis 3: If the proportion of shareholdings by individual investors and institutional investors changes significantly in the short-term and long-term, then there will exist a significant difference of abnormal return between the short-term and long-term.***

Based on the average ranking of [long-term shareholding ratio of institutional (individual) investors-short-term shareholding ratio of institutional (individual) investors], the top 1/3 are selected as samples with significant changes in the long-term and short-term shareholding ratios, long-term 60 days, short-term 20 days.

Table 3 The test of the difference of abnormal return between short-term and long-term (the shareholding of institutional investors changes significantly)

| | **The Test of Mean** | | | | **The Test of Median** | | |
|---|---|---|---|---|---|---|---|
| | **CAR (20)-AR (1)** | **CAR (60)-AR (1)** | **CAR (60)-CAR (20)** | | **CAR (20)-AR (1)** | **CAR (60)-AR (1)** | **CAR (60)-CAR (20)** |
| Average | 0.6979 | 2.1801 | 1.4836 | Median | 0.6428 | 2.0743 | 1.4558 |
| t-statistic | 25.2490 | 45.6314 | 36.2591 | Wilcoxon | 22.9364 | 36.6408 | 31.4783 |
| Probability | 0.0000*** | 0.0000*** | 0.0000*** | Probability | 0.0000*** | 0.0000*** | 0.0000*** |

Note:
1. The AR is Abnormal Return; the CAR is Cumulative Abnormal Return; in ( ) is the period
2. ***, **, and * denote significance within 1%, 5%, and 10% levels, respectively.

Table 4 Exam of the difference of abnormal returns in the short-term and long-term (the shareholding of institutional investors changes significantly)

| | **The Test of Mean** | | | | **The Test of Median** | | |
|---|---|---|---|---|---|---|---|
| | **CAR (20)-AR (1)** | **CAR (60)-AR (1)** | **CAR (60)-CAR (20)** | | **CAR (20)-AR (1)** | **CAR (60)-AR (1)** | **CAR (60)-CAR (20)** |
| Average | 0.7210 | 2.1716 | 1.4574 | Median | 0.5372 | 1.9087 | 1.1808 |
| t-statistic | 19.1815 | 32.8500 | 26.6626 | Wilcoxon | 17.4573 | 28.5795 | 24.0204 |
| Probability | 0.0000*** | 0.0000*** | 0.0000*** | Probability | 0.0000*** | 0.0000*** | 0.0000*** |

Note:
1. The AR is Abnormal Return; The CAR is Cumulative Abnormal Return; in ( ) is the period
2. ***, **, and * denote significance within1%, 5%, and 10% levels, respectively.

By Table 3 and 4, we found that the difference between the abnormal return of long-term and the abnormal return of short-term, are significantly different from 0. Therefore, we can infer that investor (individual or institutional) increase their share-holding will increase the abnormal return of the stock.

***Hypothesis 4: The main factors of information asymmetry.***

Table 5 The Unit root test

| | ADF test | | PP test | |
|---|---|---|---|---|
| | **t-statistics** | **p-value** | **t-statistics** | **p-value** |
| **PIN** | -9.5090 | 0.0000*** | -39.3192 | 0.0000*** |
| **AR** | -55.6127 | 0.0001*** | -55.6649 | 0.0001*** |
| **TURNOVER** | -5.0373 | 0.0000*** | -18.5056 | 0.0000*** |
| **INDEX** | -54.1460 | 0.0001*** | -54.0809 | 0.0001*** |
| **RATIO** | -4.5609 | 0.0008*** | -4.6761 | 0.0007*** |

Note:

1. **PIN** is information asymmetric index, **AR** is Abnormal Return, **Turnover** is turnover ratio, **INDEX** is the return of the stock index, RATIO is (the shareholdings of institutional investors/ the shareholdings of individual investor).
2. **ADF** is the test of Augmented Dickey-Fuller, **PP** is the test of Phillips and Perron, lag period chose by the criterion of AIC and SBC.
3. ***, **, and * denote significance within 1%, 5%, and 10% levels, respectively.

In Table 5, it is found that there is no unit-root, and the significance level is above 1%. Therefore, all variables are stable time series variables, and the regression of least square estimation is less prone to deviation, and the general VAR model can also be used to verify the lead and lag between variables without adjustment of the error correction model.

Table 6 Descriptive statistics

| | **PIN** | **AR** | **TURNOVER** | **INDEX** | **RATIO** |
|---|---|---|---|---|---|
| **Mean** | 0.1880 | 0.0393 | 0.5444 | 0.0220 | 0.3855 |
| **Median** | 0.1818 | 0.0446 | 0.4810 | 0.0714 | 0.3666 |
| **Maximum** | 0.6970 | 1.7499 | 1.9842 | 6.7422 | 0.4963 |
| **Minimum** | -0.2392 | -2.0739 | 0.1236 | -6.5133 | 0.2548 |
| **Std. Dev.** | 0.1700 | 0.3086 | 0.2217 | 1.1461 | 0.0636 |
| **Skewness** | 0.1090 | 0.0349 | 1.8313 | -0.3542 | 0.1276 |
| **Kurtosis** | 2.4136 | 5.0556 | 7.7182 | 7.4017 | 1.9344 |
| **Jarque-Bera** | 52.7658 | 570.3708 | 4810.2800 | 2680.0440 | 161.8840 |
| **Probability** | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

Note: **PIN** is information asymmetric index, **AR** is Abnormal Return, **Turnover** is turnover ratio, **INDEX** is the return of the stock index, RATIO is (the shareholdings of institutional investors/ the shareholdings of individual investor).

By Table 6, it is found that the average and median of all variables are positive, indicating that the variable data are greater than 0. Only the INDEX shows a slight left skewness; PIN, AR, TURNOVER and RATIO show a slight right skewness. The Kurtosis of PIN and RATIO are less than 3, which means that the distribution of the variable is not concentrated. The Kurtosis of AR, TURNOVER, and INDEX are all greater than 3, which means that the distribution is relatively concentrated. The result of the test also shows that all distributions are not normally distributed.

Table 7 Correlation coefficient

| **Correlation**<br>**Probability** | **PIN** | **AR** | **TTURNOVER** | **INDEX** | **RATIO** |
|---|---|---|---|---|---|
| **PIN** | 1.0000 | | | | |
| | --- | | | | |
| **AR** | 0.0600*** | 1.0000 | | | |
| | (0.0006) | --- | | | |
| **TURNOVER** | 0.4875*** | 0.0553*** | 1.0000 | | |
| | (0.0000) | (0.0016) | --- | | |
| **INDEX** | 0.4653*** | 0.0186 | 0.0821*** | 1.0000 | |
| | (0.0000) | (0.2904) | (0.0000) | --- | |
| **RATIO** | -0.5447*** | -0.0321* | -0.5782*** | -0.0084 | 1.0000 |
| | (0.0000) | (0.0681) | (0.0000) | (0.6309) | --- |

Note:
1. **AR** is Abnormal Return, **INDEX** is the return of the stock index, the **PIN** is information asymmetric index, **Turnover** is the turnover ratio, RATIO is (the shareholdings of institutional investors/ the shareholdings of individual investor).
2. ***, **, and * denote significance within 1%, 5%, and 10% levels, respectively.

By Table 7, we found that AR and INDEX are insignificant within 1% level. All of the correlation coefficients are positive and less than 0.6 (60%). It shows that there may be a correlation between the variables. Hence, it is impossible to cause collinearity, and general regression estimation can be performed.

Table 8 The information asymmetric regression result

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| **Constant** | 0.7533*** | 0.0293 | 25.6934 | 0.0000 |
| **AR(-1)** | -0.0044 | 0.0077 | -0.5660 | 0.5715 |
| **TURNOVER(-1)** | 0.1331*** | 0.0132 | 10.0488 | 0.0000 |
| **INDEX(-1)** | 0.0281*** | 0.0021 | 13.4560 | 0.0000 |
| **RATIO(-1)** | -0.0231*** | 0.0009 | -26.1021 | 0.0000 |
| **R-squared** | 0.3646 | | | |

Note:
1. The PIN is the dependent variable, included observations 3236
2. AR is Abnormal Return, INDEX is the return of the stock index, PIN is information asymmetric index, Turnover is the turnover ratio, RATIO is (the shareholdings of institutional investors/ the shareholdings of individual investor).
3. ***, **, and * denote significance within 1%, 5%, and 10% levels, respectively.

By Table 8, we found that the regression coefficients of RATIO, TURNOVER, and INDEX, are significantly positive. It means that there exists a positive correlation between the dependent variable and the independent variable. The coefficient of TURNOVER is the largest, followed by INDEX, and then RATIO. Hence, the turnover has the largest effect on the asymmetry of information.

Table 9 VAR Model Regression

| | **PIN** | **AR** | **TURNOVER** | **INDEX** | **RATIO** |
|---|---|---|---|---|---|
| **PIN(-1)** | 0.4403*** | -0.0780 | -0.0171 | -0.0191 | 0.0004*** |
| | [ 16.6420] | [-1.1388] | [-0.7057] | [-0.0745] | [ 2.5679] |
| **PIN(-2)** | 0.1756*** | 0.0608 | 0.0122 | -0.5268*** | 0.0005*** |
| | [ 7.9394] | [ 1.0618] | [ 0.6047] | [-2.4549] | [ 4.2097] |
| **AR(-1)** | -0.0160*** | 0.0052*** | 0.0163*** | -0.2019*** | -0.0001*** |
| | [-2.3524] | [ 0.2962] | [ 2.6170] | [-3.0548] | [-3.5247] |
| **AR(-2)** | 0.0001 | -0.0132 | -0.0056 | -0.2361*** | 0.0000 |
| | [ 0.0096] | [-0.7538] | [-0.9062] | [-3.6058] | [ 0.3685] |
| **TURNOVER(-1)** | 0.0547*** | 0.0205 | 0.6020*** | 0.1188 | 0.0000 |
| | [ 2.8724] | [ 0.4157] | [ 34.5309] | [ 0.6424] | [ 0.2957] |
| **TURNOVER(-2)** | -0.0242 | 0.0738 | 0.2297*** | 0.1373 | -0.0002* |
| | [-1.2736] | [ 1.4989] | [ 13.191] | [ 0.7435] | [-1.6755] |
| **INDEX(-1)** | -0.0011 | 0.0453*** | 0.0097*** | 0.0209 | 0.0000** |
| | [-0.4573] | [ 7.3644] | [ 4.4579] | [ 0.9057] | [ 2.2398] |
| **INDEX(-2)** | -0.0020 | 0.0155*** | 0.0028 | 0.0421* | 0.0000 |
| | [-0.9017] | [ 2.7097] | [ 1.3734] | [ 1.9571] | [ 1.0180] |
| **RATIO(-1)** | -0.7720 | -1.7069 | 1.3900 | 83.6322* | 1.2781*** |
| | [-0.1752] | [-0.1496] | [ 0.3447] | [ 1.9562] | [ 55.099] |
| **RATIO(-2)** | 0.2516 | 1.7230 | -1.7322 | -84.1997** | -0.2772*** |
| | [ 0.0568] | [ 0.1504] | [-0.4278] | [-1.9616] | [-11.901] |
| **C** | 0.2567*** | -0.0160 | 0.2235*** | 0.2154 | -0.0004*** |
| | [ 10.420] | [-0.2509] | [ 9.9144] | [ 0.9010] | [-2.9976] |
| **Adj. R-squared** | 0.5218 | 0.0302 | 0.7651 | 0.0110 | 0.9999 |

Note:

1. Included observations: 3234 after adjustment， t-statistics in [ ]
2. The PIN is information asymmetric index, AR is Abnormal Return, Turnover is turnover ratio, INDEX is the return of the stock index, RATIO is (the shareholdings of institutional investors/ the shareholdings of individual investor).
3. ***, **, and * denote significance within 1%, 5%, and 10% levels, respectively.

Table 10 Granger Causality

| Excluded | Chi-sq | Prob. |
|---|---|---|
| **Dependent variable: PIN** | | |
| **AR** | 5.5345* | 0.0628 |
| **TURNOVER** | 10.7364*** | 0.0047 |
| **INDEX** | 1.1113 | 0.5737 |
| **RATIO** | 126.1587*** | 0.0000 |
| **Dependent variable:AR** | | |
| **PIN** | 1.6049 | 0.4482 |
| **TURNOVER** | 8.8187** | 0.0122 |
| **INDEX** | 66.0025*** | 0.0000 |
| **RATIO** | 0.0284 | 0.9859 |
| **Dependent variable: TURNOVER** | | |
| **PIN** | 0.5774 | 0.7492 |
| **AR** | 7.6067** | 0.0223 |
| **INDEX** | 23.1437*** | 0.0000 |
| **RATIO** | 62.3933*** | 0.0000 |
| **Dependent variable: INDEX** | | |
| **PIN** | 8.4609** | 0.0145 |
| **AR** | 22.6414*** | 0.0000 |
| **TURNOVER** | 4.4508 | 0.1080 |
| **RATIO** | 4.0945 | 0.1291 |
| **Dependent variable: RATIO** | | |
| **PIN** | 48.2064*** | 0.0000 |
| **AR** | 12.5264*** | 0.0019 |
| **TURNOVER** | 5.4976* | 0.0640 |
| **INDEX** | 6.5500** | 0.0378 |

Note:
1. PIN is information asymmetric index, AR is Abnormal Return, Turnover is turnover ratio, INDEX is the return of stock index, RATIO is (the shareholdings of institutional investors/ the shareholdings of individual investor).
2. ***, **, and * denote significance within 1%, 5%, and 10% levels, respectively.

Table 9 shows that, for all explanatory variables AR, TURNOVER, INDEX and RATIO, there exists at least one significant coefficient for the VAR model by lagging 1 and/or 2 periods. The result of the causality test (Table 10) shows that, except for the fact that there is no causal relationship between PIN and INDEX, there may exist interaction effects among other variables.

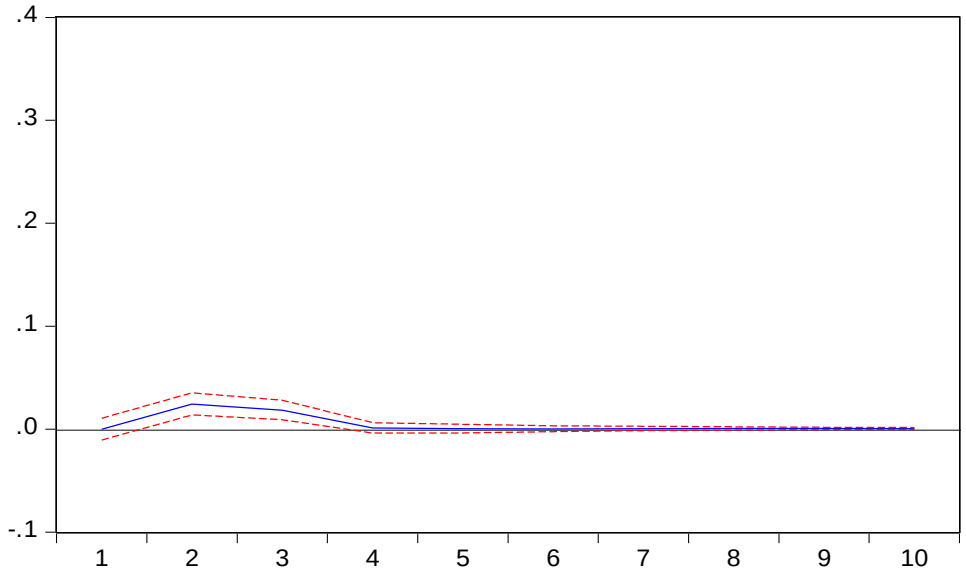



Figure 1 The response of AR(abnormal return) to PIN(information asymmetry), when the AR change 1 standard deviation.

Figure 1 shows the shock response of abnormal return (AR) to information asymmetry (PI). The results show that when the abnormal return increases by one standard deviation, the information asymmetry will slightly increase by about one period in the later period, and then gradually return, after the fourth period. There will be no effect.

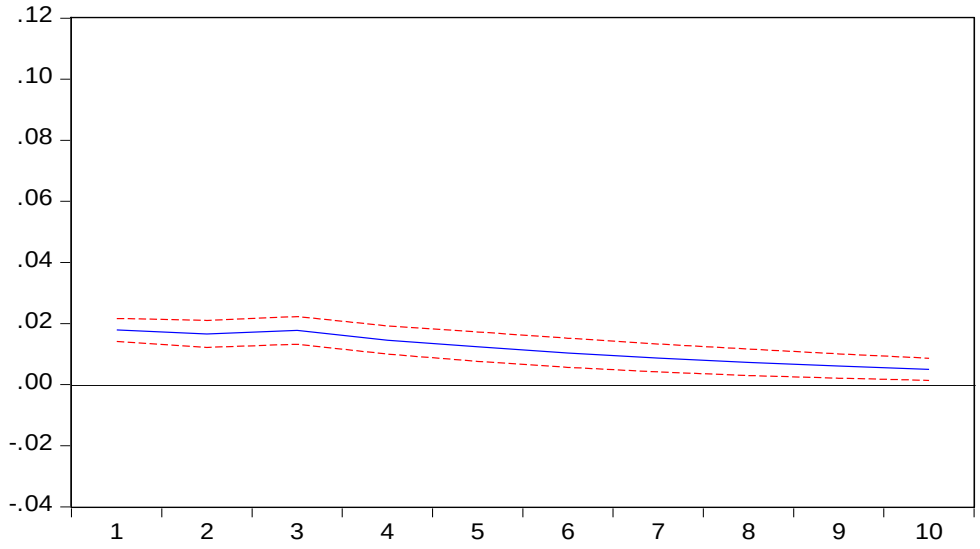



Figure 2 The response of TURNOVER (turnover ratio) to PIN (information asymmetry), when the TURNOVER change 1 standard deviation.

Figure 2 shows the impact of the turnover on the information asymmetry. The results show that when the turnover increases by one standard deviations, the information asymmetry will increase by about 0.2 standard deviation in the later period, and the effect will continue.

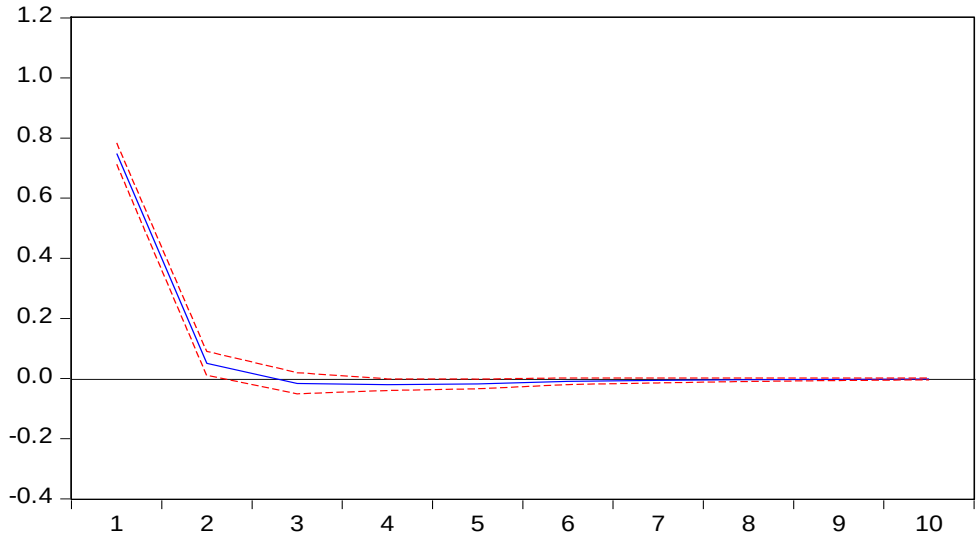
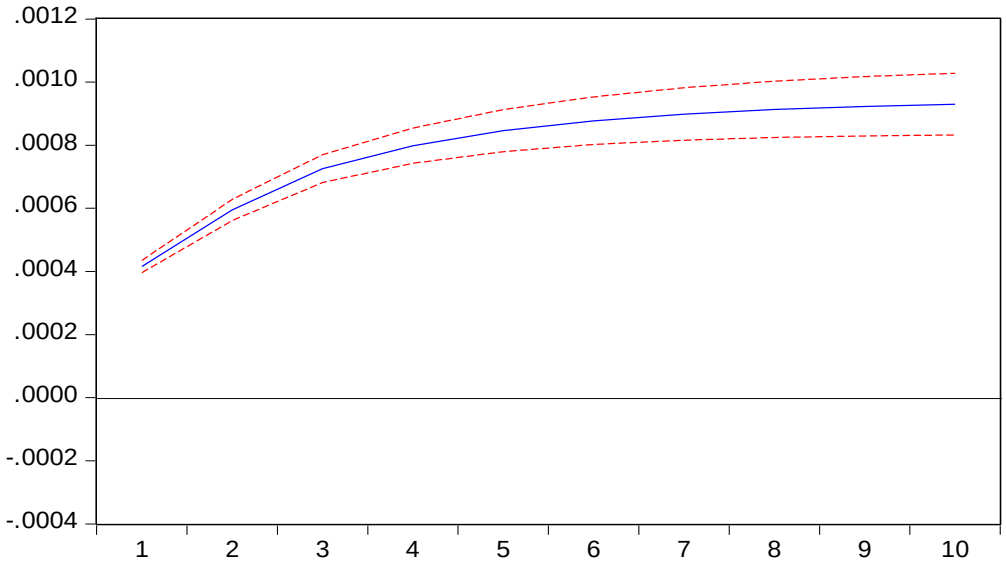



Figure 3 The response of INDEX (return of stock index) to PIN (information asymmetry), when the INDEX change 1 standard deviation.

Figure 3 shows the impact of the return of the stock index on the information asymmetry.




The results show that when the return of the stock index increases by one standard deviation, the information asymmetry will increase by about 0.7 standard deviations in the next period, and gradually after the second period. Return, there will be no effect after the third period.

Figure 4 The response of RATIO (the shareholdings of institutional investors/ the shareholdings of individual investor) to PIN (information asymmetry), when the RATIO change 1 standard deviation.

Figure 4 shows the impact of the return of RATIO on the information asymmetry. The results show that when the return of the stock index increases by one standard deviation, the

information asymmetry will increase by about 0.0004 standard deviations in the next period, and gradually rise after the second period.

Table 11 Variance Decomposition of PIN (information asymmetric)

| Period | S.E. | PIN | AR | TURNOVER | INDEX | RATIO |
|---|---|---|---|---|---|---|
| **1** | 0.1175 | 100.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| **2** | 0.1285 | 99.6383 | 0.1548 | 0.2003 | 0.0058 | 0.0007 |
| **3** | 0.1351 | 99.5589 | 0.1596 | 0.2428 | 0.0367 | 0.0019 |
| **4** | 0.1379 | 99.4625 | 0.1650 | 0.3234 | 0.0449 | 0.0043 |
| **5** | 0.1393 | 99.3964 | 0.1645 | 0.3832 | 0.0489 | 0.0070 |
| **6** | 0.1400 | 99.3365 | 0.1645 | 0.4390 | 0.0500 | 0.0101 |
| **7** | 0.1403 | 99.2870 | 0.1643 | 0.4851 | 0.0504 | 0.0133 |
| **8** | 0.1404 | 99.2454 | 0.1641 | 0.5234 | 0.0504 | 0.0166 |
| **9** | 0.1405 | 99.2112 | 0.1640 | 0.5542 | 0.0504 | 0.0202 |
| **10** | 0.1406 | 99.1832 | 0.1639 | 0.5787 | 0.0504 | 0.0238 |
| **Average** | 0.1360 | 99.4319 | 0.1465 | 0.3730 | 0.0388 | 0.0098 |

Note: The PIN is information asymmetric index, AR is Abnormal Return, Turnover is turnover ratio, INDEX is the return of the stock index, RATIO is (the shareholdings of institutional investors/ the shareholdings of individual investor).

For the variance of the information asymmetry (PI) in Table 11, the contribution from the shareholding ratio (RATIO) is about 0.009%; the contribution from the abnormal return (AR) is about 0.14%; the contribution from the turnover (Turnover) is about 2.34% (the greatest one) and the contribution comes from the return of the stock index (INDEX) is about 0.66%.

## 5. Conclusion

This paper explores the correlation among abnormal returns, information asymmetry, turnover, and market returns, and exam the influence of the shareholdings of institutional investors and individual investors on abnormal returns and information asymmetry.

First, abnormal returns exist in the Taiwan stock market for the short-term and long-term. We find that the information on the Taiwan stock market is not fully reflected, and the stock price cannot fully reflect the interference factors of reasonable prices. Secondly, the difference between the abnormal returns with a larger share of individual investors and with a larger share of institutional investors is insignificant, this shows that the information asymmetry between institutional investors and individual investors may be insignificant. If the share percentage of stocks held by individual investors and institutional investors has changed significantly in the short-term and long-term, then the long-term abnormal returns will larger than the short-term abnormal return, which mean that the effect of liquidity could affect the effect of information asymmetry. Besides, among the factors of information asymmetry, the turnover effect is the largest, the market return is the second, and the shareholding of institutional investors and individual investors the last; abnormal returns effect is not sure. In addition to the shareholding of institutional investors and individual investors, all factors link to the information asymmetry have positive correlations. There is also an interactive effect between various variables, and the interactive effect between market returns and information asymmetry is the largest.

The empirical results show that turnover has the largest impact on information asymmetry, the second is market returns. Hence, we consider that there exists information asymmetry between institutional investors and individual investors, however, this effect could be affected by liquidity and business cycle. Therefore, when we make a decision, comprehensive consideration should be made. Subsequent studies may be done by testing and comparing different samples with higher and lower liquidity in the cross-section.

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