Signaling Security Manipulation Using Logit Model (An Empirical Study in Thailand)

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ABSTRACT

This study aims at determining the appropriate variables that represent the two of the three factors (Liquidity and Return Factors) the SET uses in imposing the net settlement and/or margin trading prohibition as the data on concentration of trades, the remaining factor, is not publicly available and at examining whether the empirical tests are aligned with the regulation of the SET.

This paper may be summarized, coherently based on the results from the Univariate and Wilcoxon tests, Logit model, and graphs, that standard deviation vaguely explains the event while the focus of this paper, return and liquidity are much more effective in explaining the events through abnormal weekly returns and both types of abnormal weekly turnover respectively. However, the highest percentage of accurate prediction on warrant tests may be a result of the smallest number of samples. Mostly, return factor and liquidity factor represented by abnormal weekly volume turnover are significant in all tested scenarios. We may conclude that in conformity with the SET's regulation, both factors do have an effect on the net settlement and/or margin trading prohibition.

After the net settlement and/or margin trading prohibition, it is obvious that the magnitude of most quantitative variables is declined from the previous period although magnitude of some variables may start to decline prior to the announcement. Therefore, this may suggest that the abnormal trading is highly relevant to trades that are dependent on the net settlement and margin loan allowance. The result also suggests that the announcement of the SET does have an effect on cooling down the trading behavior of the investors.

The result from this study may not be generalized for the forecast of the Thai capital market until there is a future study which takes into account the examination of a larger number of abnormally traded sample securities.

I. Introduction

One of many unsolvable issues for stock markets around the world is manipulation of security market. It has become a common issue for both developed and emerging markets although the magnitude may differ. In accordance with Aggarwal and Wu (2003), over 10 papers published within 10 years (1992 – 2003) share interests in the market manipulation, although some may have different views from others or may conduct a test in different . A study of Khwaja and Mian (2004) on efficiency of emerging markets finds critical issues where one of the most important ones is the presence of market manipulation, more specifically the evidence reveals the existence of trade-based "pump and dump" manipulation scheme. The authorities are challenged to identify and take actions against these illegal cases. However, it remains mysterious and seems like a complicated task for regulators to unfold and eliminate such ambiguity using existing mechanisms in place.

Stock manipulation differs from speculation in terms that the profits earned from price movement in specific period that does not base on the fundamental value or news on the security. There are usually no justifiable indicative factors for the behavior of stock price in the case of manipulation. There are a number of literatures that concentrate on the capital market or price manipulation in several countries. It is collectively concluded that there are three distinctive categories of manipulation, including information-based, action-based, and trade-based manipulations.

As the name implies, information-based manipulation is the security price manipulation that is based on releasing false information or spreading rumors. Action-based refers the manipulation that is based on actions that change the actual or perceived value of the security or asset. Trade-based, which is the term most commonly found in many research papers, refers to the attempt to manipulate a stock by executing both buy and then sale transactions without taking notice of any publicly observable actions to alter the value of the firm or false information to change the price. A manipulation can be executed by either an individual or a group of individuals. Manipulators can be traders, brokers, management of the company, or outside investors; but the regulators generally pay considerable attention to the group of people who have access to the non-public information, or commonly known as "Insiders." This paper will focus on testing whether one or more financial variables can signal when a manipulation takes place on a security in the Thai capital market regardless of the category of manipulation or the type of manipulators as mentioned above.

With regard to a radio program called “Financial Health” of Eazy FM 105.5 (2002), the manipulation in the Thai capital market regularly refers to an abnormality in the price and volume of trades without any reasonable cause or actual news that should post such effects on the security. Moreover, there may be unconfirmed rumors or fallacious rumors about specific events with regard to the company whose stock is being manipulated, which is an example of information-based manipulation.

The Stock manipulation by definition of the Securities and Exchange Commission (“SEC”) refers to share sales and purchases with an intension to directly or indirectly control the stock price as to create unusualness in the stock price movements. To induce others into believing that those particular stocks are being traded at significantly high volume so that those naïve investors may fall right into the trap that is carefully planned for and successfully executed by the manipulators. Eventually, the price will be genuinely driven upward by positive feedback investors. Occasionally, manipulation is not intended for profit but either to maintain the price level of those manipulated stocks to persuade others to view that the stock price of these companies does not fall much even though the market does not perform well; to manipulate accounting figures by presenting unrealized gain from short-term investment; or to pretentiously raise the value of the short-term investment that is used as a collateral so that no additional collateral is necessary for a devalued collateral.

An article written by Anuchitvorawongse and Nikomborirak (2006) summarizes from the annual seminar of 2006 on Governance of Thai Companies and the Development of the Stock Market after the Crisis. The article overall provides a very interesting comprehensive insights and criticisms on the seriousness of the stock manipulation in Thailand; and the limitation of authorization empowered to the SET and the SEC, the only regulators who are relied upon to protect the benefits of minority investors from such manipulation. Anuchitvorawongse and Nikomborirak (2006) suggest that share price manipulation has become one of several critical problems for the Thai authorities who govern the stock market such as the SEC and the SET especially during the upward market trend resulting from new regulations enforced by the government, which makes it even easier for the manipulators to perform their artificial trading activities. Another type of trade-based manipulation that becomes fairly common in the Thai capital market is known as artificial trading through nominees.

The regulators of the Thai stock market do not possess legal authority to demand the disclosure of the identity of ultimate beneficial owners of traded securities; therefore, it causes difficulties for the SEC to detect intentional share price manipulation. In addition to the lack of certain regulations in place, the SEC is not empowered to take legal actions on those who have violated the law. The SEC is responsible for evidence gathering for further review by other authorities who are part of the justice process. According to Anuchitvorawongse and Nikomborirak (2006), the group those who are crucial part of the justice process consists of the Economic Crime Investigation Division (ECID), the Royal Thai Police or the special investigator of the Department of Special Investigation (DSI), Ministry of Justice and the evidence supporting the case needs to be reviewed and forwarded by the ECID or DSI to the Office of the Attorney General (OAG) for criminal prosecution. The article also makes comment on the persistent failure of the regulators involved to take action on the suspected manipulators, which is read

"*Perhaps with lack of understanding of the complexity of the working of a stock market, many cases submitted by the SEC failed to make it to the court. Consequently, the SEC had had to resort to the use of preventive and administrative measures*." (See Anuchitvorawongse and Nikomborirak, 2006)

As previously stated, regulators tend to focus on administrative measures rather than taking defensive actions. From an interview of an officer at the SET, the detection process starts when the SET's system, called the "Market Watch", discovers atypical behaviors of the stock price movement that are suspected potential stock manipulation; the SET will gather evidence under its authorization such as information on trades on the exchange; to retrieve data from the database or interview brokerage firms or the listed company. The authority of the SET is limited to only parties involved with the SET; therefore, the evidence preliminary collected by the SET may be insufficient to take legal action on the manipulators. The SET then passes the case to the SEC for consideration and additional evidence accumulation in order to proceed with legal course of action.

In addition to the Market Watch system of the SET, the SEC also electronically releases weekly turnover list to capture any unusual turnover of particular stocks in the market. It simply used to raise investors' concern when certain securities with unimpressive fundamental seem to have high turnover ratio (or highly traded) while the free float in the market is low. The turnover list may also be imposed as another mechanism to detect and

reduce the risk of manipulation starting in 2007 as suggested by the SEC. Will this list actually help protect investors from manipulation? The tests in this paper will include the relevance of the SEC-calculated security turnover and the stock manipulation in the past, where the stock manipulation of this particular study refers to the list of net settle and/or margin trading prohibition imposed by the SET.

According to on-line database of Siam Turakij newspaper, in spite of the monitoring mechanisms in place, The SEC has received on average 1,600 claims, including suggestions and complaints throughout 2006. Of which, 50 percent or approximately 800 claims are complaints and the top 3 issues of the complaints listed below in the order of number of complaints

1. Fraudulent acts by the management of listed companies
2. Stock manipulation by investors
3. Wrong doing by the marketing officers of securities firms

(See http://www.siamturakij.com/book/index.php?option=com_content&task=view&id=8015& Itemid=73):

The academic conference of the SEC on the Governance of the Stock Exchange of Thailand discloses

"*between 1999 and 2005, total fines levied and criminal prosecutions in share price manipulation and insider trading amounted to 36 cases, or only 3.6% of all fines and criminal cases the SEC handled during this period. This low ratio is indicative of regulatory limitations mentioned above. (Moreover,) penalties (fines and jail term) in Thailand for false disclosures are still significantly lower than that of stock markets in the same region. Furthermore, in practice the SET and SEC still do not yet seriously penalize those who propagate false disclosures: between 1999 and 2005, the SEC fined only 18 cases relating to false disclosures, and filed criminal charges for only 1 case of this type.*" (See Achavanuntakul, 2006)

Achavanuntakul (2006) also makes several recommendations with regard to the internal conflicts of the regulators and broadening scope of regulatory enforcement to all parties involved in the issue of manipulation. It is a proof that the matter is well aware of; however, the preventive and defensive measures are not yet efficiently developed.

To be profitable in the stock market, investors should rely on the intrinsic value or the fundamental price of the company that comes from its operation rather than the observed

price in the stock market that can be a result of artificial trading. To prevent from being victimized by sophisticated manipulators, naïve investors should have a fundamental knowledge on the matter and a tool that can assist them in detecting any potential manipulation before hand in order to assist them in making investment decisions.

Prior to permission of net settlement in trading transactions, buy and sell transactions were not easily executed as investors had to finance their purchase transaction instead of using the proceeds from share sales. Therefore, purchasing power of the investors was automatically controlled. Net settlement allows investors to sell and purchase securities on the same day by netting the proceeds and payments. Investors may then enjoy such trading facility that they forget to be cautious about their financial limitations. Margin loan is another facility for the investors to trade or speculate on borrowed funds. When a manipulation is suspected, the SET will impose net settlement and/or margin trading prohibition on such security to reduce the heat from speculative or artificial trading. The criteria that the SET applies to enforce the net settlement and/or margin trading prohibition are described in Appendix A. It can be implied that the SET focuses on monitoring three factors, which are concentration of trades, liquidity, and abnormal return of the securities, in determining suspected manipulations. However, there are more than one variable that can represent the previously mentioned factors and it is uncertain of which variables the SET actually monitors for the manipulation detection purposes.

This study aims at determining the appropriate variables that represent the two of the three factors the SET uses in imposing the net settlement and/or margin trading prohibition as the data on concentration of trades is not publicly available and at examining whether the empirical tests are aligned with the regulation of the SET. When a conclusion for the two objectives is successfully drawn, unsophisticated investors may be able to find preventive tools from security manipulation; and therefore, they will have an option to avoid investing their money in those stocks that may be manipulated under consideration of the two previously mentioned factors. The past data from the stocks that are on the list of net settlement and/or margin trading prohibition may help us predict the future manipulation if the regulation of the SET (Appendix A) is strictly enforced.

This paper is organized as follows. Section II reviews the relevant literature on previous studies. Section III describes framework of the study and the data and methodology used in this study are discussed in Section IV. Section V discusses the results on the variables that

may potentially signal securities manipulation in the Thai stock market. Finally, section VI provides a conclusion and discusses the limitations of the study.

II. Literature Review

In the past, many practitioners and academic researchers have studied and identified motives, factors that cause the stock price manipulation in stock markets around the world. Some approaches may be more sophisticated than the others. One of many problems that authorities of the stock market in many countries may agree upon is that they cannot yet put a stop to such misbehavior. Manipulators will always find a loophole around the regulations and legalize their actions.

The studies conducted internationally mainly concentrate on the examination of historical manipulations in several countries using different variables and models to explain such events for different authors and markets. There are similarities and differences in terms of research criteria and empirical results. Jarrow (1992) focuses on investigating market manipulation trading strategies by large traders in a securities market under the assumption that the large traders have no information, or referred to as trade-based manipulation. His research is conducted to study the strategies used by large traders to manipulate the price and the relationship between such strategies and hypotheses on the equilibrium price process. He finds that the manipulation is possible with the presence of price momentum or if the speculator can corner the market, which can be summarized that whether large traders can manipulate prices to their advantage and generate profits at no risk is dependent on the properties of the price process as a function of the speculator's trades. Another finding of Jarrow (1992) is that the existence of market manipulation trading strategies is related to time asymmetry in the sensitivity of price changes to the speculator's trades. Therefore, asymmetries create manipulation opportunities, which otherwise would not exist. The study of Allen and Gale (1992) is popularly referred to by those researchers who are interested on this particular issue and conduct their research on stock market manipulation. They categorize manipulation into three kinds as mentioned in previous section: action-based, information-based, and trade-based. The main objective of their study is to examine whether it is possible to generate profits from different kinds of manipulation apart from insider trading and a release of false information by investigating profitable, trade-based manipulation in a model where all agents are rational. They limit their scope to examine the trade-based manipulation by referring to the theory of rational expectations where all agents want to maximize their expected utility. The paper concludes that trade-based stock manipulation is consistent with rational utility-maximizing behavior of agents even though there is no price momentum and no possibility of a corner, which contradicts the work of

Jarrow (1992). Aggarwal and Wu (2003) extend their framework from that of Allen and Gale (1992), which examines various forms of market manipulation and their implications for stock market efficiency. Their paper also seeks to generate testable, cross-sectional implications about the evolution of the prices, volume, and volatility in cases of the stock market manipulation. They claim to be the first to use a sample of actual manipulation cases in examining stock market manipulation in the U.S. In consistent with Allen and Gale (1992), they examine whether a manipulator can distort the stock price away from its true value and profitably trade on this distortion. However, their methodology differs in that they incorporate information seekers or arbitrageurs into the model and examine the effect they have on the possibility of manipulation. In conformity to Jarrow (1992), they also construct the model under an assumption that price momentum occurs such that the future price of a security is dependent on today's price and types of transaction. It is information asymmetry together with pooling that allows a successful manipulation. The manipulation target is normally illiquid security whose volatility increases during the manipulation period. It is concluded at the time the manipulator sells, prices are higher when the liquidity and volatility are greater due to higher number of information seekers and greater dispersion in the market's estimate of the stock value respectively. The results suggest that market manipulation may post crucial impacts on the market efficiency as price transparency is distorted. Consistent with their analysis, the stock market manipulation occurs most in inefficient markets, which are considered to be small and illiquid as well as having relatively low disclosure requirements and less rigid securities regulations and rules.

One of a good example of inefficient markets is KSE, which is the main exchange of Pakistan. Khwaja and Mian (2004) investigate the manipulation in the KSE that is caused by poor governance of market intermediaries where majority of brokers may act as principals instead of intermediaries. They also try to identify unusual trading patterns and suitable benchmark for the market. This study is unique in terms of data set as the authors acquire at a unique trade level, which refers to all daily trades of each broker in every stock trading on the KSE. The paper assumes that two or more brokers colluding together to transact artificial trades, which is consistent with findings of Aggarwal and Wu (2003) in that most manipulation schemes involve participation of several parties. This is also considered evidence for a "pump-and-dump" manipulation scheme where brokers jointly trade among themselves to raise the price to attract positive feedback investors or trend chasers, which is consistent with the trade-based manipulation of Allen and Gale (1992). Because principal brokers incur market manipulation as they have lower transaction costs and better access to

real-time information than outside investors, they cause a further delay to emerging market development. It becomes an unattractive place for a business to raise capital or for an investor to invest. Another example of trade-based manipulation is introduced by Jiang, Mahoney, and Mei (2005) who study another scheme of manipulation through a stock pool of 1920s, which prompted the current anti-manipulation rules in the United States. They aim to answer the similar questions as other studies previously mentioned on whether an uninformed trader can profit from buying and then selling an asset and whether profitable trade-based manipulation is common in actual asset markets. Their main focuses are on the cross-sectional variation in returns, turnover, and other measures among the pools and the long-term abnormal returns of pool stocks. The sample of pool stocks begins with every stock named by the Senate as the subject of a pool in 1929. They find that the pool stocks are comparable to their associated industry portfolios on measures of size and are more volatile and liquid, on average, than other companies in their industry, which is inconsistent with Aggarwal and Wu (2003) in the sense that they suggest that mostly illiquid stocks are more likely to be subject to manipulation. Moreover, they also find a strong cross-sectional relation between abnormal turnover and returns around the time of pool formation for the pools that were not formed around the time of rights offerings. While the pattern of stock price and trading volume could be consistent with market manipulation, they find no evidence that the stock pools' trades drove prices to artificially high levels. It is concluded that the evidence is more consistent with the hypothesis that abnormal returns associated with the pools resulted from informed trading rather than successful trade-based manipulation. The relationship between trading volume and price changes during pools is consistent with models of profitable manipulation and with informal descriptions of pump and dump schemes. However, the average magnitude of the abnormal returns is modest and there is no indication that these returns are reversed after the accumulation period ends as suggested by Aggarwal and Wu (2003).

Among several literatures reviewed, I found that two of those share the same interest in examining manipulation in closing prices. Closing price is the price that is most applicable for both academic researchers and practitioners in analysis, valuation, and projection purposes. Closing prices are widely used because they are convenient and are assumed to fairly represent the end of day value of the stock. Generally, closing price should reflect all of company's information that is released during the trading hours. Therefore, manipulating stock prices should affect all parties involved in the capital market including businesses, investors, regulators, and traders. In accordance with Felixson and Pelli (1998), another

application of closing price directly relates to traders' performance appraisal. They examine the Helsinki Stock Exchange to see if closing prices are manipulated using trade-based by traders or not. They do not derive to the conclusion of whether or not there is a manipulation on the closing price based on the tests. The weakness and insignificance of the results could be from inappropriateness of proxy such as the after-market return, which is rather noisy as there is new information traveling between the market closing of one day and market re-opening of the next day. This proxy then does not affect true market price of the security at the time. Another study on the closing price manipulation is conducted on the Paris Bourse of France by Hillion and Suominen (2004). The authors develop an agency-based model of closing price manipulation as they believe that the customers perceive the execution quality of a trader based on the only available information, observed prices. Therefore, traders have motive to impress their customers by manipulating the closing price. The test results suggest that the intraday volatility of stock returns and volume are u-shaped, which reasonably implies that there is unusual activities near and until market closing. The paper suggests that availability of intraday data may help reduce brokers' incentives to manipulate prices as well as adoption of other reference prices that are more difficult to manipulate than the closing price to evaluate broker performance. The rationale behind the suggestion is that with availability of intraday data, customers can compare transaction prices that occur in the time period close to one another. The incentives for manipulation may also arise from a value-based commission and the reputation gain from managing high value merger and acquisition (M&A) transactions where closing prices have a major contribution.

Another perspective of the stock price manipulation of Hanson, Oprea, and Porter (2004) study the effect of manipulators on an experimental market. The evidence in the paper suggests that despite the fact that manipulators make systematically higher price offers in this particular manipulation setting, non-manipulators accepted systematically lower price offers. A possible explanation is that when agents suspect the presence of manipulators and are aware of the manipulators' intention, the manipulation will become ineffective. Such reluctance to accept the offers of manipulators as previously mentioned effectively cancel out the distortion impact of the price manipulation. Based on the theory of rational expectations that predict the stock prices, at equilibrium without any possibility for price distortion, will reflect all the information held by market participants. Therefore, the economists are becoming more interested in predicting future events using the information from the securities markets.

To my knowledge, there has been no record on any studies that focus on signaling or predicting security manipulation, or even approaches that are applied to test the signal of stock price manipulation in Thailand. However, there are two research papers on Thai capital market that are relevant to the manipulation topic, which include "Insider Trading in Thailand" by Boonyawat (2004) and another paper written in 2004, which is archived from the website of the SET, with undisclosed author's name, called "Insider Trading: Preliminary Study of Thai Capital Market."

The paper by Boonyawat (2004) uses the data available in the Form 59-2 [1] and Form 246-1 to explain the impact of insider trading on the market efficiency of Thai capital market. She aims to examine whether an outsider can potentially use public information to earn abnormal returns as insiders do. The study is separated into the examination of purchase and sale transactions. The evidence suggests that corporate insiders, by definition of Form 59-2, can effectively predict abnormal future stock price changes for purchase transactions as they receive favorable private information on the company and act on it before it is released to the public and consequently pushes up the stock price. On the other hand, the corporate insiders poorly predict the change in stock price for sales transactions as they mostly sell stocks prior to a rise. The result is as expected that the outsiders earn insignificant positive abnormal returns after excluding the transaction costs. Evidently, the Thai stock market is semi-strong form where all public information is absorbed and reflected in the stock price. The paper also suggests that top management of Thai firms do not have more indication on the future prospects of the firm than other insiders. As a result, the longer the lag time between insider trading days and information announcement days by the SEC, the greater abnormal returns are be earned by the insiders. Because of strict regulations in use, the corporate insiders cannot afford a lengthy delay of information disclosure in order to generate personal trading profits.

Another research on this topic supported by the SET is fairly similar to that of Boonyawat (2004) in that it examines the market content of insider trades in developing market, Thai stock market. However, this study extends its scope to investigate the behavior of insider trading activities during the 1997 economic crisis and how this activity has changed

[1] In accordance with Securities and Exchange Act of B.E. 2535 Section 59, the director, manager, and persons who maintain management positions as specified in the notification of the SEC, and auditors of a listed company shall be required to prepare Form 59-2 to the SEC on each person's securities holding and the holding of securities by his/her spouse and minor children of securities in the company including changes in such holdings under the rules and procedures as specified in the notification of the SEC. Under this section, the persons specified above must report his/her trading in securities of this particular listed company within 3 working days after the transaction date.

overtime by also examining how to market reacts around the insider trading dates. Moreover, it also investigate the information content of the insider trading by testing whether it can predict future market movements and whether it can explain the individual cross-sectional stock returns. The sample data is also collected from Form 59-1 and 59-2, which is almost similar to the source of information used by Boonyawat (2004). Another difference between these two studies is the period coverage, where Boonyawat (2004) covers the more recent period of 2002 and 2003 and the other one covers the period of economic crisis, which include 1993 to 1999. This latter mentioned paper also uncovers the linkage between the insider trading and the market excess returns, which suggests that the insiders on average purchase during the down market and sell during the up market. In contrast with Boonyawat (2004), this paper suggests that the insiders usually buy when average abnormal returns of stocks are zero or positive and sell when stock prices are high, which infers that they have a fair ability to predict the price movements. The paper evidences that there is information content of insider trading with much stronger evidence at the firm level than that of the aggregate level.

One of the objectives of this study, as previously stated in the Introduction section, is to find indicative variables (limited to the two out of three factors stated in Appendix A) that the SET applies in order to impose the net settlement and/or margin trading prohibition on particular securities, which signals the market manipulation. The finding may be beneficial to unsophisticated investors as they may use one or more particular models that are proven to be explanatory in making their investment decision. This study will not focus on the type of the manipulations or whether or not it relates to insider trading, but rather concentrate on testing the quantitative measures, where the data is publicly available and can be self-calculated by most investors who have access to such data.

The major difference between this study and the past studies stated above is that their contribution are either to test the new models on this particular matter or are meant to explain the past events, which may or may not be applicable to the current market conditions. Some try specifically test the information-based manipulation or insider trading. This paper however, intends to find a suitable approach to signal the future events. Aforementioned literatures and studies share one or more similar theories that support their views and methodologies in the papers, this paper is also prepared based upon one or more of these theories and will be described in the Section III.

Previous research papers have studied several indicative factors that potentially associate with the manipulation in different stock markets. Aggarwal and Wu (2003) evidence that prices, trading volumes, and volatility rise during the alleged manipulation and then prices fall afterwards, suggesting that profitable manipulation could have occurred. Jiang, Mahoney, and Mei (2004) apply the cross sectional variation in returns, turnover, and other measures among the pools such as the long-term abnormal returns of pool stocks as independent variables for their study. Similarly, some of the variables to be examined in this study include the abnormal returns and abnormal turnover, which are computed in the same formulas. On the other hand, Felixson and Pelli (1998) apply some different variables such as size of the net position and different size of net position for different firms, block trades, and spread trades. Boonyawat (2004) indicates that the stocks in the sample must by issued in the SET and must have about 10 months of return data prior to the event day, in other word, the data must be available in 230 days before and after the event day (-230 to 230 days, event day is counted as 0 day). These criterions ensure that she is able to estimate the market model and standardize abnormal return. On the other hand, another study of the SET uses estimation period of -120 to -31 for the market model and event period from -30 to +30. As there is neither specific rule on the estimation period nor a written best practice guideline, I will select the estimation period of -135 to -31, which covers the two-year period and is believed to be normal practice in the market for weekly data estimation. However, the actual number of weeks may not reach 104 weeks or two years as there are non-trading weeks or suspension period for some sample stocks.

Overall, my study will focus on the three groups of variables widely used in other studies, which consist of liquidity measures, volatility measures, and price (or return) measures. Each variable and the result from the test will be described in the Section IV

Most of the studies on market manipulation have been conducted using regression on cross-sectional data as follows. The standard OLS regression is used in the study of Felixson and Pelli (1998) to study the closing price manipulation in the Finnish stock market. Jiang, Mahoney, and Mei (2004) apply cross-sectional analysis of pool return and turnover using a simple regression and compare the result to that of Aggarwal and Wu (2004). They also make adjustments to the LMSW model (refers to Llorente et al., 2002) by using the intuition that follows from Jarrow (1992), Allen and Gale (1992), Aggarwal and Wu (2004), and Mei et al. (2004) in creating models of successful manipulation.

Dissimilarly to the aforementioned approaches, methodologies that will be applied in this study are Logit and Probit models. This study may be the first to apply econometric tools in an attempt to explain the market manipulation. As I am concerned, these two models have never been applied in this particular area of study before. They are widely used in predicting the occurrence of particular events. Thesis paper of Termsuknirandorn (2000) is conducted to forecast whether commercial banks, trust funds, and funds in Thailand may experience future crises based on the stability of the institutions using the Logit and Probit models. Termsuknirandorn (2000) also empirically studies the history of crises that occurred to the financial institutions to conclude the reasons that cause instability to those institutions. She follows the past studies that use financial ratio analysis together with econometric approach, the Logit model, to explain the stability in operating businesses and to predict a probability of failure. Her findings indicate that financial ratios that may post a significant impact on the crisis of commercial banks include the ratio of interest receivable to loans and accounts receivable, which reflects the liquidity and quality of debtors. Another financial ratio that has a crucial effect is accumulative profit to total assets, which represents the efficiency in profit generation. The study concludes that the models have ninty-percent accuracy in predicting such crisis. These models are then applied as forecasting mechanisms for events and used to explain the significance of each variable, which will help increase understanding of the conditions and clarification of the indicative variables in connection with the events. In addition to Termsuknirandorn (2000), Chitmongkolsamur (2003) also uses Unconditional Fixed Effect Logit and Fixed Effect Probit models with panel data to invent an early warning system for Thai Commercial Banks to prevent future crisis using the data from the financial crisis that severely affected all commercial banks in 1997. The results of both models are relatively close and thus, provide the same conclusion.

III. Theoretical Framework

There are five crucial theories and concepts in composition of the framework of this study: the Rational Expectations Theory, the Efficient Markets Theory, Signaling Theory, Information Asymmetry Theory, and the econometric methodology, the Logit model, which is applied to test the financial variables whether they can potentially signal the manipulation that may potentially be placed on the list of net settlement and/or margin trading prohibition and whether the securities that have been prohibited from net settlement and/or margin trading are empirically consistent with the regulation of the SET.

Rational Expectations Theory

According to Sargent (1986), the theory suggests that price of an asset tomorrow should be based on its price today and is partly dependent on the expectation of what will happen in the future that may have an impact on the future price based on the available information. Expectations of people are the key to the almost if not all capital markets around the world. The theory is first proposed in the early sixties. It describes that there is a two-way relationship between the influences of expectations and outcomes. Investors tend to predict what will happen in the future prior to making investment decisions where the future decisions will be based on what perceived outcomes of the past. Investors who earn significant profits from the market are a good example of those who either have a superior ability to effectively forecast the future; or have particular information that is not available to other investors or the market; or have a better capability to adjust from their past experiences to mitigate forecasting errors. The concept of rational expectations emphasizes that outcomes do not normally deviate from people's expectations. Without additional assumptions on human behavior, the concept alone does not make a correct implication on the current stock markets as it assumes that human do not make systematic errors and the price will converge to market equilibrium when in reality, this is not the case. Therefore, the model representing the theory includes a random error term to represent the role of ignorance and forecasting mistakes.

In terms of practical use, Sargent (1986) writes:

"Rational expectations (theory) undermines the idea that policymakers can manipulate the economy by systematically making the public have false expectations."

We may then apply the combination of the concept of rational expectations and behavioral finance for practical use to explain the behavior of speculators in that their expected future

will determine current actions under different assumptions on behavior. However, one assumption that may be applicable to almost if not all situation is the utility maximization, which states that all agents will try their best to maximize their utility based on a given function. Sometimes, this concept can be associated with the game theory with or without the presence of information asymmetries. The rational expectations hypothesis has been widely applied, particularly, in the field of economics both in practice and academic researches. For example, Sargent and Wallace develop the Policy Ineffectiveness Proposition to anticipate economic effects that will be caused by changing monetary policy. In spite of its global acceptance, the theory is criticized to be an unrealistic model in the formation of expectations as it ignores associated costs and the fact that the future is filled with uncertainties. It can be concluded that rational expectations theory can be achieved with presence of many of both internal and external factors, which may be idealistic. Despite the theory has been profoundly criticized, it is applied and adapted in many academic fields apart from finance and economics.

The Efficient Markets Theory of Stock Prices

The market is perceived to be efficient when the prices of traded securities reflect all relevant information. The efficient market hypothesis ("EMH") explains that the shares are traded in the market on the fair value; therefore, it is not possible for investors to make profit from purchasing undervalued or selling overvalued shares. The implication of the hypothesis is that it is unfeasible to consistently outperform the market whether with or without any expertise in portfolio selection or other concepts that are based on the idea that the market can be defeated. Investors can then generate earnings from investing in risky assets for high returns. Similar to the rational expectations theory, EMH is often criticized as it contradicts the use of market prediction through fundamental or technical analysis. In fact, there have been many sophisticated investors who can partially outperform and gain speculative profits from the market. This is an example to argue the underlying concept of the EMH.

In financial markets, the EMH does not apply exactly as prices are highly flexible. However, it has been proven that the stock prices move according to the random walk process as they both reflect fundamental value of stocks and take into account reaction of the market on observed behavior. Not all markets can apply the concept of EMH as they have drastic difference characteristics and regulations. Even so, EMH is applied to explain the inefficiency of certain emerging markets.

As suggested by Khwaja and Mian (2004) that emerging markets are generally inefficient as the stock prices do not reflect all the relevant information that signals that intrinsic value of the stocks, which causes a loophole for stock price manipulation. It can be partially explained by the lack of effective regulations on the disclosure of information by the listed companies or other collusive activities. In spite of the comments that emerging markets are mostly inefficient, it is evidenced by Boonyawat (2004) that the Thai market is considered a semi-strong form. Therefore, all public information is reflected in the stock price.

In accordance with Sargent (1986), it can be concluded that with the concept of rational expectations theory, the EMH of stock prices, under the assumption that the stock price is properly adjusted for discounting and dividends as well as follow the random walk, the investors can forecast prices using all sources of information and patterns of observed past movements.

EMH places its focus on the relevant information that is publicly available and its effective reflection on the stock prices; therefore, persisting manipulation problems may occur from inability of the market to meet the conditions of any forms of market efficiency or that they are not exactly information-based manipulation.

The Signaling Theory

When we do not have perfect information, we sometimes have to perceive and make assumptions based on the information available on hand or observed activities in order to make decisions. Signaling theory describes why certain signals are reliable and others are not. Signaling mostly occurs in competitive environments. The sender only transmits the information that he wishes the receiver to perceive regardless of the quality and accuracy of such information. In general context, potential prey may signal to predators that they are poisonous or that they have options to either escape or fight back. In the business, regardless of their actual power, potential competitors may signal their strength to each other. One of the requirements for signaling is that the signals must be intentional, and intended for profit maximization of the signaler. However, it is also important for the receiver to feel beneficial from acting on the signal, otherwise, it will be ignored and the signaler will experience the failure. Commonly, it is true that signals are reliable when the punishment is so severe that discourages signalers to take such risk.

This is another theory that can be applied to the market manipulation concept as manipulators have to send signals to positive feedback investors for the manipulation to be

successful. I believe that signals in Thai market may not be strongly reliable as suggested earlier that the manipulators in the market still challenge regulators by searching for loophole of the law. The key to success of signaling is that the investors must feel that the signal is reliable, or they will not act on it either. Successful manipulation can be a fine proof o how well the manipulators understand other investors and can effectively signal or trick them.

Information Asymmetry

In many emerging markets, as suggested by Khwaja and Mian (2004), the principal-agent problem persists with the presence of information asymmetry where traders and investors do not possess the similar information. This concept is also essential to engage in a successful manipulation through signaling theory.

The regulators of stock exchanges are well aware of the problems arise from information asymmetries. However, they have not yet been able to justify the actions. Some capital markets strictly enforce the disclosure rules while other markets can only encourage investors and business owners to submit the information due to an absence of appropriate level of empowerment.

Logit & Probit Models

Cramer (2003) and Fox (2007) clearly explain the methodologies of the Logit and Probit models as well as analyze the application of the two.

These two models are econometric tools that are widely used to signal the bank failure both internationally by examining relevant financial variables. They can predict the magnitude of accuracy of the models and significant variables that can explain the particular events. The models are also applied in Thailand to create an alarm system for the authorities in monitoring performance of commercial banks. The Logit model will be applied for the first time in examination of the security market manipulation and in finding appropriate explanatory variables from the models. The model is briefly summarized below from Cramer (2003) and Fox (2007):

From Cramer (2003);

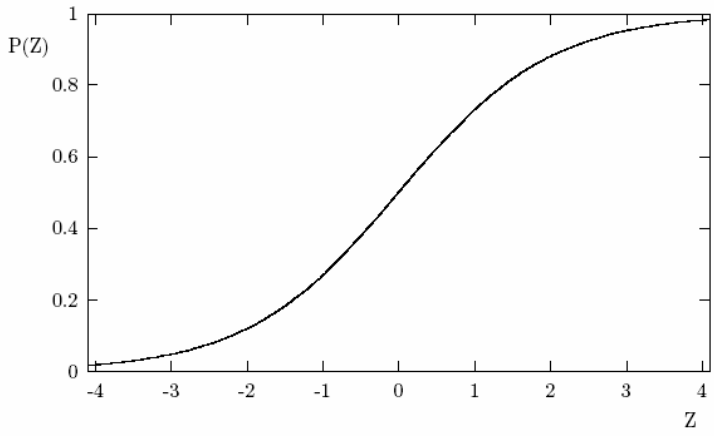

Figure 1 : The Logistic Curve P(Z)

The Figure 1 from Cramer (2003) explains that the curve of Figure 1 is traced by the logistic[2] cdf[3], which read:

$$P(Z) = \frac{\exp Z}{1 + \exp Z} \qquad \text{(III-1)}$$

P behaves like the distribution function of a symmetrical density, with mid-point zero; as *Z* moves through the real number axis, *P* rises monotonically between the bounds of zero and 1. The meaning of this function varies according to the definition of the variables. Generally, *P* is the probability of a binary outcome and $Z = \alpha + \beta X$, with X representing a continuous stimulus or exposure variable. The α determines the location of the curve on the *X*-axis, and β represents its slope. In logistic regression there are several determinants of *P*, and $Z = x^T \beta$, with *x* a vector of covariates (including a unit constant) and β their coefficients. But the logistic function was originally designed to describe the course of a *proportion P* over time *t*, with $Z = \alpha + \beta X$; it is a *growth curve*, since *P*(*t*) rises monotonically with *t*.

From Fox (2007);

Fox (2007) describes a consistent theoretical concept of the Logit and Probit models, where probability responses model (Logit and Probit) are the techniques for analyzing the

[2] A logistic distribution has the cdf $F(x) = 1/(1+e^{-x})$
This distribution is quicker to calculate than the normal distribution but is very similar. Another advantage over the normal distribution is that it has a closed form cdf. pdf is $f(x) = e^x(1+e^x)^{-2} = F(x)F(-x)$ (http://economics.about.com/library/glossary/bldef-logistic-distribution.htm).

[3] Cumulative distribution function ("CDF"). This function describes a statistical distribution. It has the value, at each possible outcome, of the probability of receiving that outcome or a lower one. A cdf is usually denoted in capital letters. Consider for example some F(x), with x a real number is the probability of receiving a draw less than or equal to x. A particular form of F(x) will describe the normal distribution, or any other unidimensional distribution.

relationship between fixed-level independent variables and a dependent variable constrained to vary between 0 and 1. To insure that dependent variable stays between 0 and 1, a positive monotone is required (i.e., non-decreasing) function that maps the 'linear predictor'

$$\eta = \alpha + \beta X \tag{III-2}$$

Into the unit interval

A transformation of this type will retain the fundamentally linear structure of the model while avoiding probabilities below 0 or above 1. Any cumulative probability distribution function meets this requirement:

$$\pi_i = P(\eta_i) = P(\alpha + \beta X_i) \tag{III-3}$$

Where the cumulative density function $P(\cdot)$ is selected in advance, and α and β are then parameters to be estimated.

Using the normal distribution $\phi(\cdot)$ yields the linear Probit model

$$\begin{aligned} \pi_i &= \Phi(\alpha + \beta X_i) \\ &= \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\alpha + \beta x_i} e^{-\frac{1}{2}z^2} dz \end{aligned} \tag{III-4}$$

Using the logistic distribution $\Lambda(\cdot)$ yields the linear Logit model

$$\begin{aligned} \pi_i &= \Lambda(\alpha + \beta X_i) \\ &= \frac{1}{1 + e^{-(\alpha + \beta X_i)}} \end{aligned} \tag{III-5}$$

The illustration of the logistic cdf is presented in Figure 2 below:

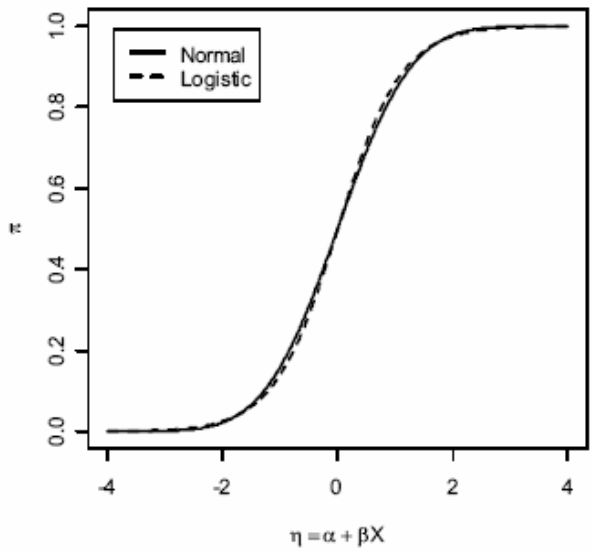

Figure 2 : The normal and logistic cumulative distribution functions (as a function of the linear predictor and with variances equated) (See Fox, 2007)

Fox (2007) suggests that despite their similarity of the Logit and the Probit models, there are two practical advantages of the Logit model:

1. *Simplicity:* The equation of the logistic cdf is very simple, while the normal cdf involves an unevaluated integral.
    - This difference is trivial for dichotomous data, but for polytomous data, where we will require the *multivariate* logistic or normal distribution, the disadvantage of the probit model is more acute.
2. *Interpretability:* The inverse linearizing transformation for the logit model, $\Lambda^{-1}(\pi)$, is directly interpretable as a *log-odds*, while the inverse transformation $\phi^{-1}(\pi)$ does not have a direct interpretation.
    - The Logit model produces a much more adequate summary of the data that is very close to the nonparametric regression.

Another proof that illustrates the popularity of the Logit over the Probit model apart from its advantages is suggested in Table 1.

Table 1 : Summarized by Cramer (2003), the table presents the number of articles published during 1935 to 1994 in the JSTOR, electronic repertory of major statistical journals in the English language, that contain the word 'probit' or 'logit':

	Probit	Logit
1935 – 39	6	-
1940 – 44	3	1
1945 – 49	22	6
1950 – 54	50	15
1955 – 59	53	23
1960 – 64	41	27
1965 – 69	43	41
1970 – 74	48	61
1975 – 79	45	72
1980 – 84	93	147
1985 – 89	98	215
1990 – 94	127	311

Table 1 shows that the popularity of the models has increased over time. In spite of later arrival of the Logit model in 19th century, number of times that it has been referred to has substantially increased and exceeded that of the Probit model. As suggested in the research of Termsuknirandorn (2000), the Logit and Probit models provide relatively close results in reflecting the crises of commercial banks to be caused by the failure of internal management. Moreover, one of the basic assumptions for this study is that the fixed effect is applied to the Logit model as it is assumed that the fixed effect is highly relevant to the standard errors; therefore, the Probit model is not applied due to the absence of fixed effect option.

IV. Methodology

The study will focus on the stocks and warrants that are placed on the list of net settlement and/or margin trading prohibition by the SET during the period of January 1, 2004 to December 31, 2006. The information on the name of sample securities and the periods that they are on the list of the SET is obtained from the SET and summarized in Table 2.

Table 2 : The list of stocks that are not allowed net settlements and/or margin trading during January 2004 – December 2006

Ref. No. (ID)	Security Code	Type	Order of Enforcement	No. of Days	Period Start	Period End
1	APURE	Stock	1	5	11/2/2005	17/2/2005
			2	10	18/2/2005	4/3/2005
			3	20	7/3/2005	1/4/2005
			4	20	4/4/2005	9/5/2005
2	APURE	Stock	5	15	15/9/2005	5/10/2005
			6	30	6/10/2005	17/11/2005
			7	30	18/11/2005	3/1/2006
			8	60	11/1/2006	5/4/2006
			9	60	1/4/2006	7/7/2006
3	ASL	Stock	1	30	17/11/2005	30/12/2005
			2	30	3/1/2006	14/2/2006
4	EMC	Stock	1	30	11/8/2006	22/9/2006
N/A	EVER	Stock	1	30	21/7/2006	1/9/2006
			2	30	26/9/2006	7/11/2006
5	EWC	Stock	1	15	14/9/2005	4/10/2005
			2	30	5/10/2005	16/11/2005
			3	30	17/11/2005	30/12/2005
6	IEC	Stock	1	15	19/10/2005	9/11/2005
			2	30	10/11/2005	23/12/2005
			3	60	26/12/2005	21/3/2006
			4	60	22/2/2006	22/6/2006
7	LIVE	Stock	1	5	25/1/2005	31/1/2005
			2	10	1/2/2005	14/2/2005
N/A	KEST	Stock	1	5	9/1/2004	15/1/2004
			2	10	16/1/2004	29/1/2004
N/A	MME	Stock	1	30	22/2/2006	4/4/2006
			2	60	5/4/2006	6/7/2006
8	NNCL	Stock	1	30	21/11/2006	5/1/2007
9	RK	Stock	1	30	21/11/2006	5/1/2007
10	APURE-W1	Warrant	1	5	11/2/2005	17/2/2005
			2	10	18/2/2005	4/3/2005
			3	20	7/3/2005	1/4/2005

Ref. No. (ID)	Security Code	Type	Order of Enforcement	No. of Days	Period Start	Period End
			4	20	4/4/2005	9/5/2005
11	APURE-W1	Warrant	5	15	15/9/2005	5/10/2005
			6	30	6/10/2005	17/11/2005
			7	30	18/11/2005	3/1/2006
			8	60	11/1/2005	5/4/2006
12	ASL-W4	Warrant	1	15	5/10/2005	26/10/2005
			2	30	27/10/2005	8/12/2005
N/A	EWC-W1	Warrant	1	15	14/9/2005	4/10/2005
			2	30	5/10/2005	16/11/2005
			3	30	17/11/2005	30/12/2005
13	NNCL-W1	Warrant	1	30	21/11/2006	5/1/2007
Total No. of Event Obs :			**43**			
No. of Event Obs for the Test :			**34**			

*Data from the SET as of January 26, 2007

There are altogether eleven stocks and four warrants that are on such list. However, with limitation of data only eight stocks and three warrants are included in the tests. The rationale behind the selected samples is that KEST and MME are newly listed stocks, in December 2003 and December 2005 respectively, with no record of historical price to calculate abnormal returns, abnormal turnover, and abnormal volume turnover. For EVER, the stock has been consistently suspended from trading activities until 2003; therefore, this poses a limitation on the variable estimation. To be consistent, only eight stocks are included in the sample set. There is one warrant excluded from the sample set, EWC-W1, as it was listed in June 2005. Therefore, this is another sample whose variable estimated is limited. The securities data is collected from the database of the SET, which includes the Setsmart website and www.set.or.th. Moreover, other sources include the securities database of Trinity Wattana Plc. and www.sec.or.th. Qualitative data are selected from several sources of valuable information such as notifications and announcements of the SEC and the SET, web boards, websites of securities firms, and other popular search engines.

To my knowledge, previous empirical tests that seek to predict the market manipulation is not yet available; therefore, no single methodology is proven to be the most appropriate for prediction of such event as none can be referred to from the literature review in Section II.

The econometric methodology to be applied to test significance of variables in signaling potential manipulations is the Logit model, which has been proven to have predictive power over the corporate and bank failure, identification of financial distress in several industries, and etc. Therefore, it may be practicable in manipulation prediction as well. The sample data is prepared in a pattern of pseudo panel data to be appropriately tested using Conditional Fixed Effect Logit model. The program STATA Version 9.0 is found to be highly helpful for testing the models.

Relevant Periods

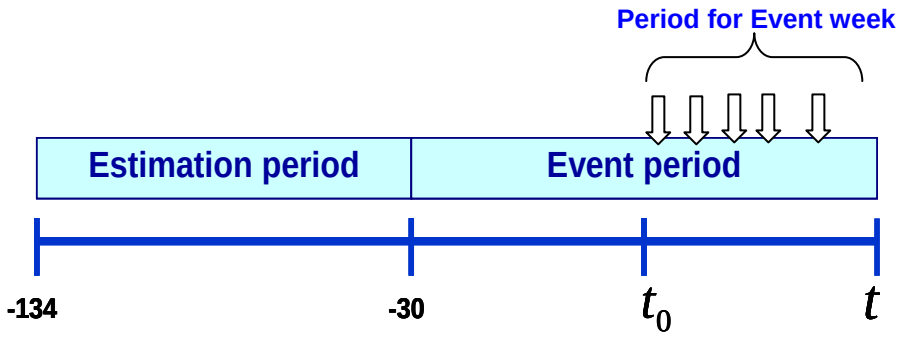

Figure 3 : Illustration of the periods that are relevant to this paper

- **Event period :** refers to the study period that is used to examine the model. It is categorized by the type of security due to diversity in data limitation of each type.

  Stocks

  - For most stocks, the event period covers -30 to t = +19 where period 0 refers to the first week (t_0) that the stock is reported on the list of net settlement and/or margin trading prohibition of the SET. It has to be noted that only the first week of the first time that the security appears on the list is considered period 0.
  - For APURE only, the event period is split into two separate event periods due to the length of all nine events with a break of four months between the forth and fifth events. Therefore, the event periods are from -30 to t = +55 for the first event and from -30 to t = +75 for the latter event.

Warrants

- For most warrants, the event period covers -30 to t = +8 where period 0 refers to the first week (t_0) that the stock is reported on the list of net settlement and/or margin trading prohibition of the SET. It has to be noted that only the first week of the first time that the security appears on the list is considered period 0.
- For APURE-W1 only, the event period is split into two separate event periods due to the length of all eight events with a break of four months between the forth and fifth events. Therefore, the event periods are from -30 to t = +60 for the first event and from -30 to t = +60 for the latter event.

- **Event week :** refers to the first week of each time that the stock is placed on the list of net settlement and/or margin trading prohibition. The week covers a Friday until the following Thursday. When the SET announces the prohibition, the event week is the week that the day falls into. The value of Y of 1 will be given for each event week otherwise the value will be 0.
- **Estimation period :** refers to the period used to estimated coefficients and averages for abnormal variable calculation, which includes abnormal returns, abnormal turnover, and abnormal volume turnover. The period is the duration from -134 to -31 for all sample securities.

Model Setup

The Logit model is applied according to the Equation (IV-2) as dependent variable for this study is qualitative variable that represents the probability of the stock sample being suspected and prohibited from non-cash trading. The study focuses on the pseudo panel analysis in conformity to the hypotheses to examine the data in comparison to the historical performance of each stock and compare all the problem stocks whose incidents occur in the different periods. Hence, the dependent variable will be converted to dummy variable where 0 refers to the probability that the stock is prohibited from net settlement and/or margin trading and 1 represents the probability that non-cash trading is allowed the stock during such period (being on the list of net settlement and margin trading prohibition of the

SET). The dependent variable is represented in the form of binary variable. The independent variables are quantitative variables, which will also be mentioned below:

$$Y_{it} = f(X_{1it}, X_{2it}, X_{3it}, ..., X_{nit}) \quad \text{(IV-1)}$$

where Y refers to a binary dummy dependent variable whose value replies on the conditions below:
Y = 1 if the stock price is prohibited from non-cash trading
Y = 0 if otherwise
X_{nit} refers to independent and dummy variables for the test as in Table 3

The Logit model is

$$P(Y_{it} = 1) = G(Y_{it}) \quad \text{(IV-2)}$$

where $P(Y_{it} = 1)$ is probability that $Y_{it} = 1$
$G(Y_{it})$ is logistic probability function

Most reviewed journals commonly use the three groups of independent variables, which represent volatility, liquidity, and magnitude of returns, to explain the past manipulations by studying the characteristics of variables that are categorized by these particular factors, although some papers may apply somewhat different independent variables to explain the volatility while others may use different variables to symbolize the liquidity factor.

The independent variables for this paper are based on the variables used by previous studies related to the stock price manipulation, which have been proven to be partially or fully contribute to the phenomenon and are consistent with the two of the three factors that are used by the SET to monitor abnormal trading activities, which have been categorized into two separate groups by the type of security as in Table 3 below. Some of the independent and dummy variables are consistent with the criteria used by the SEC for the weekly turnover announcement. Moreover, all of the independent and dummy variables set up based on the assumption that the SET may delay an announcement of net settlement and/or margin trading prohibition with regard to the monitoring process for abnormal trading activities. Therefore, only lag time of the variables will be considered in the analysis as to examine the potential signals from one or more variables. I select lag of -1, -2 and -3 periods, which represent the weekly data from a week, two weeks, and three weeks prior to the week that net settlement and/or margin trading prohibition is announced by the SET.

Table 3 : The list and description of variables used in this study. All the t's behind each variable reference refers to the time period that the variables belong to (for example, X2_1 represents P/E ratio from the week prior to the event week and X3_2 represents the weekly stock returns from the 2 weeks prior to the event week, and so on). Some of the variables will be described in detail below the table.

Independent and Dummy Variable Index					
Factor	**Ref.**	**Variable Definition**	**Application**		**Data Collection/Calculation**
			Stock	**Warrant**	
Independent Variables					
Volatility	**X1_t**	Two-week Standard Deviation on Stock Returns	Y	Y	Standard deviation of daily stock returns for two week-period
Return	**X2_t**	P/E	Y	N	P/E data as of Thursdays from SETSMART (if the stock is not traded on Thursday, the variable will be replaced by closing price from previous day)
	X3_t	Weekly Return	Y	Y	$R_{it+1} = \ln(P_{it+1}/ P_{it})$ Where: R_{it+1} = Return on stock i for week t+1; P_{it+1} = Closing price of stock i on Thursday of week t+1; P_{it} = Closing price of stock i on Thursday of week t (if the stock is not traded on Thursday, the variable will be replaced by closing price from previous day)
	X4_t	Abnormal Weekly Return	Y	Y	To be described below

Independent and Dummy Variable Index					
Factor	**Ref.**	**Variable Definition**	**Application**		**Data Collection/Calculation**
			Stock	**Warrant**	
Liquidity	**X5_t**	Weekly Turnover - SEC	Y	N	One-week Turnover = Total weekly trading value of stock[4] x 100 % Free float [5] x Average daily market capitalization of stock[6]
	X6_t	% Change in Weekly Turnover-SEC	Y	N	$\%TO_{it+1} = (TO_{it+1} - TO_{it}) / TO_{it}$ Where: $\%TO_{it+1}$= Change in turnover of stock i for week t+1 TO_{it+1} = Weekly turnover of stock i for week t+1 TO_{it} = Weekly turnover of stock i for week t
	X7_t	Abnormal Turnover-SEC	Y	N	To be described below
	X8_t	Weekly Volume Turnover	Y	Y	Sum of trading volume for the week/Number of outstanding shares
	X9_t	% Change in Weekly Volume	Y	Y	$\%VO_{it+1} = (VO_{it+1} - VO_{it}) / VO_{it}$ Where: $\%VO_{it+1}$= Change in weekly volume turnover of stock i for

[4] Total weekly trading value of stock refers to the sum of daily trading value of the stock for 5 working days in a week. If there are less than 5 working days in a week, it will be replaced with an average daily trading value multiplied by 5.

[5] In conformity to the SEC, % Free float = Total number shares – Number of shares of strategic shareholders x 100
Total number of shares

Where: - Total number of shares refers to the total number of paid-up shares subtracts the number of treasury stocks
- Strategic shareholders, according to the SEC, include shareholders who invest in the company for involvement in business management or for a business strategy.

[6] Average daily market capitalization refers to the sum of daily market capitalization of the stock from every working day in a week divided by the number of working days in that particular week.

Independent and Dummy Variable Index					
Factor	**Ref.**	**Variable Definition**	**Application**		**Data Collection/Calculation**
			Stock	**Warrant**	
		Turnover			week t+1 VO_{it+1} = Weekly volume turnover of stock i for week t+1 VO_{it} = Weekly volume turnover of stock i for week t
	X10_t	Abnormal Volume Turnover	Y	Y	To be described below
Dummy Variables					
Return	**D1_t**	Return $\geq$ 10%	Y	Y	Value of 1 if weekly return is no less than 10%, otherwise, the value will be 0
	D2_t	P/E > 100 times	Y	N	Value of 1 if P/E is above 100 times, otherwise, the value will be 0
	D4_t	AR > 0	Y	Y	Value of 1 if abnormal return is positive, otherwise, the value will be 0
Liquidity	**D3_t**	Weekly Turnover $\geq$ 20%	Y	N	Value of 1 if weekly turnover is no less than 20%, otherwise, the value will be 0
	D5_t	Abnormal Turnover > 0	Y	N	Value of 1 if abnormal turnover is positive, otherwise, the value will be 0
	D6_t	Abnormal Volume Turnover > 0	Y	Y	Value of 1 if abnormal volume is positive, otherwise, the value will be 0

Calculation of Abnormal Return, Abnormal Turnover, and Abnormal Volume Turnover

- **Abnormal Return**

  The estimation period for abnormal return (AR) is previously defined to be from week -134 to week -31. Abnormal returns are throughout the event period calculated in the same manner as the study on Insider Trading available on the SET's website: www.set.or.th using the Market model, which is described below:

$$AR_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt} \quad \text{(IV-2)}$$

  where AR_{it} is the abnormal return of stock i from event week t

  R_{it} is the actual return on stock i from week t (as shown in Table 3)

  R_{mt} is the market return of event week t

  $\hat{\alpha}_i, \hat{\beta}_i$ are the OLS coefficients from the estimation period.

- **Abnormal Turnover - SEC**

  The expected volume turnover is defined by the average of turnover by the formula of the SEC, as shown in Table 3, over the estimation period (week -134 to week -31).

  The abnormal volume turnover is calculated as follows

$$ATO_{it} = TO_{it} - \overline{TO}_i \quad \text{(IV-3)}$$

  where ATO_{it} is the abnormal turnover of stock i from event week t

  TO_{it} is the actual turnover on stock i from week t (as shown in Table 3)

  $\overline{TO}_i$ is the expected turnover on stock i from week t as previously described

- **Abnormal Volume Turnover**

  The expected volume turnover is defined by the average of weekly volume per share over the estimation period (week -134 to week -31).

The abnormal volume turnover is calculated as follows:

$$AVO_{it} = VO_{it} - \overline{VO}_i \qquad \text{(IV-4)}$$

where AVO_{it} is the abnormal volume turnover of stock i from event week t

VO_{it} is the actual volume turnover on stock i from week t (as shown in Table 3)

$\overline{VO}_i$ is the expected volume turnover on stock i from week t as previously described

The testable hypotheses of this paper to examine the efficiency of regulation of the SET in the area of net settlement and/or margin trading prohibition from manipulative activities detection are defined below:

Hypotheses

H1 : The SET uses the Return factor from historical data of a security to help monitor abnormal trading activities before imposing the net settlement and/or margin trading prohibition.

H2 : The SET uses the Volatility factor from historical data of a security to help monitor abnormal trading activities before imposing the net settlement and/or margin trading prohibition.

H3 : The SET uses the Liquidity factor from historical data of a security to help monitor abnormal trading activities before imposing the net settlement and/or margin trading prohibition.

H4 : There is a relationship between the weekly turnover of stocks calculated with the formula of the SEC and the net settlement ad/or margin trading prohibition.

V. Empirical Results

Univariate test for manipulated stocks is conducted to show the relationship between each variable and each stock whether the manipulation can be explained by investigating a single variable of each sample. Wilcoxon rank-sum test is an alternative test to the independent t-test, which may be more appropriate than the t-test in the case that the sample is very small

Table 4 : Summary of Univariate and Wilcoxon Tests for Sample Stocks

		Stock														
	Y	X1			X2			X3			X4			X5		
		n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.
ID=1	0	46	0.057174	0.035318	46	39.453260	104.812200	46	-0.005652	0.159884	46	0.002391	0.158538	46	21.536960	48.935540
	1	4	0.110000	0.000000	4	0.000000	0.000000	4	0.507500	0.193455	4	0.515000	0.185203	4	64.350000	38.842410
	Diff		-0.052826			39.453260			-0.513152			-0.512609			-42.813040	
	Independent sample		t = -2.9634 p-value = 0.0047*			t = 0.7458 p-value = 0.4594			t = -6.0696 p-value = 0.0000*			t = -6.1332 p-value = 0.0000*			t = -1.6981 p-value = 0.0960***	
	Wilcoxon rank sum		z = -2.951 p-value = 0.0096*			z = 0.760 p-value = 0.4471			z = -3.167 p-value = 0.0015*			z = -3.152 p-value = 0.0016*			z = -2.557 p-value = 0.0960***	
ID=2	0	58	0.064310	0.035939	58	127.704100		58	-0.011552	0.175057	58	-0.008448	0.172340	58	38.158450	48.469520
	1	9	0.072222	0.037006	9	38.697780		9	0.277778	0.277344	9	0.274444	0.285312	9	117.841100	158.562900
	Diff		-0.007912			89.006360			-0.289330			-0.282893			-70.682660	
	Independent sample		t = -0.6122 p-value = 0.5425			t = 1.2105 p-value = 0.2305			t = -4.2364 p-value = 0.0001*			t = -4.158 p-value = 0.0001*			t = -3.0983 p-value = 0.0029*	
	Wilcoxon rank sum		z = -0.500 p-value = 0.6169			z = 2.143 p-value = 0.0321**			z = -3.026 p-value = 0.0025*			z = -2.990 p-value = 0.0028*			z = -2.418 p-value = 0.0156**	
ID=3	0	47	0.031915	0.020814	47	761.880400		47	0.004043	0.094700	47	0.014468		47	10.435740	12.886770
	1	2	0.045000	0.035355	2	0.000000	0.000000	2	0.030000	0.014142	2	0.035000		2	88.380000	97.778730
	Diff		-0.013085			761.880400			-0.025957			-0.020532			-77.944260	
	Independent sample		t = -0.8538 p-value = 0.3975			t = 0.5194 p-value = 0.6059			t = -0.3837 p-value = 0.7030			t = -0.3048 p-value = 0.7619			t = -5.6433 p-value = 0.0000*	
	Wilcoxon rank sum		z = -0.771 p-value = 0.4480			z = 1.177 p-value = 0.2394			z = -1.216 p-value = 0.2240			z = -0.835 p-value = 0.4035			z = -2.021 p-value = 0.0433**	
ID=4	0	48	0.039375	0.029780	48	24.716250	25.963660	48	-0.004375	0.014617	48	0.007917	0.091952	48	26.402080	32.528730
	1	1	0.090000	n/a	1	113.120000	n/a	1	0.650000	n/a	1	0.670000	n/a	1	144.190000	n/a
	Diff		-0.050625			-88.403750			-0.654375			-0.662083			-117.787900	
	Independent sample		t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a	
	Wilcoxon rank sum		z = -1.505 p-value = 0.1322			z = -1.734 p-value = 0.0830***			z = -1.1701 p-value = 0.0889***			z = -1.700 p-value = 0.0892***			z = -1.697 p-value = 0.0897***	
ID=5	0	46	0.053478	0.039789	46	12.025650	3.614489	46	-0.036522	0.105330	46	-0.067826	0.111812	46	129.547400	149.861200
	1	3	0.046667	0.011547	3	11.103330	3.227388	3	0.170000	0.220681	3	0.136667	0.225463	3	338.756700	301.296800
	Diff		0.006812			0.922319			-0.206522			-0.204493			-209.209300	
	Independent sample		t = 0.2931 p-value = 0.7708			t = 0.4301 p-value = 0.6691			t = -3.0761 p-value = 0.0035*			t = -2.8867 p-value = 0.0059*			t = -2.2044 p-value = 0.0324**	
	Wilcoxon rank sum		z = -0.358 p-value = 0.7206			z = 0.500 p-value = 0.6167			z = -1.671 p-value = 0.0948***			z = -1.587 p-value = 0.1124			z = -1.960 p-value = 0.0500**	

*, **, *** denote significance at 1, 5, and 10%level respectively

Table 4 : Summary of Univariate and Wilcoxon Tests for Sample Stocks (Cont.)

		Stock														
	Y	X6			X7			X8			X9			X10		
		n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.
ID=1	0	46	2.805652	10.820460	46	0.155435	48.935700	46	9.630652	22.223490	46	4.922826	24.397700	46	6.374130	22.223300
	1	4	-0.300000	0.201494	4	42.965000	38.840550	4	24.242500	22.949700	4	-0.310000	0.410447	4	20.990000	22.950120
	Diff		3.105652			-42.809570			-14.611850			5.232826			-14.615870	
	Independent sample		t = 0.5685 p-value = 0.5722			t = -1.6979 p-value = 0.0960***			t = -1.2587 p-value = 0.2142			t = 0.4249 p-value = 0.6728			t = -1.2590 p-value = 0.2141	
	Wilcoxon rank sum		z = 1.395 p-value = 0.1630			z = -2.557 p-value = 0.0106**			z = -2.325 p-value = 0.0201**			z = 1.270 p-value = 0.2042			z = -2.325 p-value = 0.0201**	
ID=2	0	58	0.402931	1.955741	58	19.009310	48.469050	58	18.702240	24.279050	58	0.481724	2.033248	58	14.530860	24.278690
	1	9	2.693333	6.762054	9	98.691110	158.526900	9	51.396670	78.434170	9	7.288889	20.341140	9	47.225560	78.434730
	Diff		-2.290402			-79.681800			-32.694430			-6.807165			-32.694690	
	Independent sample		t = -2.1332 p-value = 0.0367**			t = -3.0983 p-value = 0.0029*			t = -2.5567 p-value = 0.0129**			t = -2.5726 p-value = 0.0124**			t = -2.5567 p-value = 0.0129**	
	Wilcoxon rank sum		z = -0.717 p-value = 0.4732			z = -2.418 p-value = 0.0156**			z = -1.765 p-value = 0.0775***			z = -0.653 p-value = 0.5139			z = -1.765 p-value = 0.0775***	
ID=3	0	47	0.448085	1.467996	47	-6.303191	12.886560	47	8.151489	10.181600	47	0.592979	1.644237	47	-5.565319	10.181530
	1	2	4.095000	4.758829	2	71.640000	97.778720	2	68.390000	92.121870	2	3.525000	5.904341	2	54.670000	92.121870
	Diff		-3.646915			-77.943190			-60.238510			-2.932021			-60.235320	
	Independent sample		t = -3.1380 p-value = 0.0029*			t = -56433 p-value = 0.0000*			t = -4.9682 p-value = 0.0000*			t = -2.2064 p-value = 0.0323**			t = -4.9679 p-value 0.0000*	
	Wilcoxon rank sum		z = -1.819 p-value = 0.0689***			z = -2.021 p-value = 0.0433**			z = -1.061 p-value = 0.2886			z = -0.202 p-value = 0.8398			z = -1.061 p-value = 0.2886	
ID=4	0	48	0.469792	1.496217	48	-21.539790	32.529340	48	14.509580	18.488430	48	0.522083	1.521630	48	-0.980417	18.488430
	1	1	11.170000	n/a	1	96.240000	n/a	1	77.860000	n/a	1	10.530000	n/a	1	62.370000	n/a
	Diff		-10.700210			-117.779800			-63.350420			-10.007920			-63.350420	
	Independent sample		t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a	
	Wilcoxon rank sum		z = -1.698 p-value = 0.0896***			z = -1.697 p-value = 0.0897***			z = -1.697 p-value = 0.0897***			z = -1.697 p-value = 0.0896***			z = -1.697 p-value = 0.0897***	
ID=5	0	46	0.879130	3.588526	46	-27.953700	149.860600	46	37.558260	44.669130	46	1.067609	3.634748	46	15.319130	44.669300
	1	3	0.450000	0.646297	3	181.256700	301.296800	3	114.916700	104.992900	3	0.533333	0.649025	3	92.676670	104.992900
	Diff		0.429131			-209.210400			-77.358410			0.534275			-77.357540	
	Independent sample		t = 0.2049 p-value = 0.8385			t = -2.2045 p-value = 0.0324**			t = -2.6614 p-value = 0.0106**			t = 0.2519 p-value = 0.8022			t = -2.6613 p-value = 0.0106**	
	Wilcoxon rank sum		z = -0.542 p-value = 0.5877			z = -1.960 p-value = 0.0500**			z = -2.002 p-value = 0.0453**			z = -0.751 p-value = 0.4528			z = -2.002 p-value = 0.0453**	

Table 4 : Summary of Univariate and Wilcoxon Tests for Sample Stocks (Cont.)

		Stock														
	Y	X1			X2			X3			X4			X5		
		n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.
ID=6	0	45	0.037556	0.021863	45	22.028890	47.972070	45	0.034889	0.125238	45	0.067111	0.132023	45	23.498000	22.661490
	1	4	0.045000	0.023805	4	64.235000	79.390510	4	0.080000	0.114018	4	0.095000	0.081035	4	48.457500	51.281980
	Diff	-0.007444			-42.206110			-0.045111			-0.027889			-24.959500		
	Independent sample	t = -0.6488 p-value = 0.5196			t = -1.5998 p-value = 0.1163			t = -0.6942 p-value = 0.4910			t = -0.4132 p-value = 0.6814			t = -1.8784 p-value = 0.0665***		
	Wilcoxon rank sum	z = -0.724 p-value = 0.4690			z = -1.316 p-value = 0.1881			z = -1.061 p-value = 0.2887			z = -0.530 p-value = 0.5958			z = -1.096 p-value = 0.2733		
ID=7	0	47	0.045957		47	0.000000	0.000000	47	-0.010426	0.098642	47	0.010426	0.098752	47	47.175750	61.249590
	1	2	0.115000		2	0.000000	0.000000	2	0.255000	0.275772	2	0.265000	0.247487	2	173.190000	164.685200
	Diff	-0.069043			0.000000			-0.265426			-0.254575			-126.014300		
	Independent sample	t = -2.3815 p-value = 0.0213**			t = n/a p-value = n/a			t = -3.4829 p-value = 0.0011*			t = -3.3854 p-value = 0.0014*			t = -2.6777 p-value = 0.0102*		
	Wilcoxon rank sum	z = -2.210 p-value = 0.0271**			z = n/a p-value = n/a			z = -2.000 p-value = 0.0455**			z = -2.076 p-value = 0.0379**			z = -1.617 p-value = 0.1059		
ID=8	0	48	0.058333	0.140233	48	10.243960	4.942380	48	-0.048333	0.339050	48	-0.041042	0.333564	48	11.705420	18.268270
	1	1	0.060000	n/a	1	17.580000	n/a	1	0.540000	n/a	1	0.570000	n/a	1	73.060000	n/a
	Diff	-0.001667			-7.336042			-0.588333			-0.611042			-61.354580		
	Independent sample	t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a		
	Wilcoxon rank sum	z = -1.422 p-value = 0.1550			z = -1.344 p-value = 0.1791			z = -1.702 p-value = 0.0887***			z = -1.700 p-value = 0.0891***			z = -1.626 p-value = 0.1039		
ID=9	0	48	0.044583	0.030244	48	0.000000	0.000000	48	0.007708	0.111111	48	0.024375	0.109659	48	28.947710	57.626880
	1	1	0.040000	n/a	1	0.000000	n/a	1	0.240000	n/a	1	0.260000	n/a	1	204.440000	n/a
	Diff	0.004583			0.000000			-0.232292			-0.235625			-175.492300		
	Independent sample	t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a		
	Wilcoxon rank sum	z = -0.395 p-value = 0.6931			z = n/a p-value = n/a			z = -1.558 p-value = 0.1193			z = -1.594 p-value = 0.1109			z = -1.556 p-value = 0.1198		

Table 4 : Summary of Univariate and Wilcoxon Tests for Sample Stocks (Cont.)

		Stock														
	Y	X6			X7			X8			X9			X10		
		n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.
ID=6	0	45	0.663556	1.996302	45	-6.540000	22.661650	45	16.809780	17.254490	45	0.870889	2.540113	45	-2.249333	17.254330
	1	4	0.102500	0.990501	4	18.422500	51.284580	4	39.672500	43.362910	4	0.290000	1.451826	4	20.612500	43.362910
	Diff		0.561056			-24.962500			-22.862720			0.580889			-22.861830	
	Independent sample		t = 0.5521 p-value = 0.5835			t = -1.8785 p-value = 0.0665***			t = -2.1944 p-value = 0.0332**			t = 0.4480 p-value = 0.6562			t = -2.1944 p-value = 0.0332**	
	Wilcoxon rank sum		z = 0.584 p-value = 0.5590			z = -1.096 p-value = 0.2733			z = -1.388 p-value = 0.1653			z = 0.493 p-value = 0.6220			z = -1.388 p-value = 0.1653	
ID=7	0	47	1.675319	7.281883	47	16.411060	61.250950	47	26.967870	35.563670	47	2.190000	10.123170	47	12.589150	35.563840
	1	2	-0.490000	0.438406	2	142.425000	164.678100	2	104.355000	98.012070	2	-0.475000	0.459619	2	89.975000	98.012070
	Diff		2.165319			-126.013900			-77.387130			2.665000			-77.385850	
	Independent sample		t = 0.4163 p-value = 0.6791			t = -2.6776 p-value = 0.0102*			t = -2.8224 p-value = 0.0070*			t = 0.3686 p-value = 0.7141			t = -2.8223 p-value = 0.0070*	
	Wilcoxon rank sum		z = 1.238 p-value = 0.2157			z = -1.617 p-value = 0.1059			z = -1.668 p-value = 0.0954***			z = 1.112 p-value = 0.2663			z = -1.667 p-value = 0.0954***	
ID=8	0	48	0.792917	2.399920	48	2.766875	8.267760	48	3.595833	5.518389	48	0.939792	3.157989	48	1.136667	5.518029
	1	1	-0.170000	n/a	1	64.120000	n/a	1	26.810000	n/a	1	-0.070000	n/a	1	24.350000	n/a
	Diff		0.962917			-61.353130			-23.214170			1.009792			-23.213330	
	Independent sample		t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a	
	Wilcoxon rank sum		z = 0.212 p-value = 0.8320			z = -1.626 p-value = 0.1039			z = -1.627 p-value = 0.1038			z = 0.212 p-value = 0.8320			z = -1.627 p-value = 0.1038	
ID=9	0	48	1.645208	3.160250	48	-12.166670	57.627890	48	19.723750	38.099380	48	1.698958	3.904800	48	7.545833	38.100630
	1	1	0.990000	n/a	1	163.320000	n/a	1	122.390000	n/a	1	0.780000	n/a	1	110.220000	n/a
	Diff		0.655208			-175.486700			-102.666200			0.918958			-102.674200	
	Independent sample		t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a	
	Wilcoxon rank sum		z = -0.354 p-value = 0.7236			z = -1.556 p-value = 0.1198			z = -1.556 p-value = 0.1197			z = -0.283 p-value = 0.7773			z = -1.556 p-value = 0.1198	

Interpretation method of the results in Table 4: The example of Univariate test on stock 1 (ID=1) illustrates that the mean value of X1 or standard deviation of two-week daily stock returns that is believed to be neutral (46 non-manipulated weeks out of 50, where Y=0) is 0.058, while the mean value for the manipulated period of 4 weeks out of total 50 weeks (Y=1) is 0.110. The P-value for the independent test of higher than 0.01, 0.05, and 0.10 implies that the variable cannot effectively explain the manipulation event at 99%, 95%, and 90% level of confidence respectively.

The results from Table 4 can be described as follows; the Univariate test and the Wilcoxon test mostly provide the same implication on each variable at a different level of confidence. The result shows that change in weekly turnover and weekly volume turnover has no significant effect on the event. Two-week standard deviation of daily returns and P/E ratio do not have much impact on most securities except for a few

whose events can be explained partly by these variables. Return factor represented by weekly returns and abnormal weekly returns fairly affect the event and sometimes they are significant to the model when we consider the independent test and insignificant when the Wilcoxon test is considered, and vice versa. Return and liquidity factors seem to have the same level of impact which is significant in explaining the event with regard to the stocks.

Univariate test for manipulated warrants is conducted to show the relationship between each variable and each warrant whether the manipulation can be explained by investigating a single variable of each warrant sample.

Table 5 : Summary of Univariate and Wilcoxon Tests for Sample Warrants

		Warrant														
	Y	X1			X2			X3			X4			X5		
		n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.
ID=10	0	47	0.14723	0.064495				47	-0.010213	0.255023	47	0.00340	0.252029			
	1	4	0.2025	0.055603				4	0.717500	0.531813	4	0.74	0.508396			
	Diff	-0.055266						-0.727713			-0.736596					
	Independent sample	t = -1.6583 p-value = 0.1036						t = -4.9909 p-value = 0.0000*			t = -5.1485 p-value = 0.0000*					
	Wilcoxon rank sum	z = -1.476 p-value = 0.1400						z = -3.120 p-value = 0.0018*			z = -3.103 p-value = 0.0019*					
ID=11	0	48	0.090000	0.049250				48	-0.019583	0.186410	48	-0.020833	0.182242			
	1	8	0.126250	0.089433				8	0.420000	0.478450	8	0.428750	0.473118			
	Diff	-0.036250						-0.439583			-0.449583					
	Independent sample	t = -1.6919 p-value = 0.0964*						t = -4.7025 p-value = 0.0000*			t = -4.8917 p-value = 0.0000*					
	Wilcoxon rank sum	z = -0.717 p-value = 0.4735						z = -3.456 p-value = 0.0005*			z = -3.703 p-value = 0.0002*					
ID=12	0	36	0.074444	0.057987				36	-0.031944	0.333054	36	-0.015833	0.330034			
	1	2	0.090000	0.042426				2	0.095000	0.091924	2	0.135000	0.049498			
	Diff	-0.015556						-0.126944			-0.150833					
	Independent sample	t = -0.3717 p-value = 0.7123						t = -0.5315 p-value = 0.5983			t = -0.6378 p-value = 0.5276					
	Wilcoxon rank sum	z = -0.823 p-value = 0.4104						z = -1.406 p-value = 0.1596			z = -1.865 p-value = 0.0622***					
ID=13	0	37	0.089189	0.142466				37	-0.054054	0.392715	37	-0.079189	0.373990			
	1	1	0.080000	n/a				1	0.540000	n/a	1	0.550000	n/a			
	Diff	0.009189						-0.594054			-0.629189					
	Independent sample	t = n/a p-value = n/a						t = n/a p-value = n/a			t = n/a p-value = n/a					
	Wilcoxon rank sum	z = -1.064 p-value = 0.2873						z = -1.689 p-value = 0.0912***			z = -1.690 p-value = 0.0911***					

*, **, *** denote significance at 1, 5, and 10%level respectively

Table 5 : Summary of Univariate and Wilcoxon Tests for Sample Warrants (Cont.)

Warrant														
	Y	X6			X7			X8			X9			X10		
		n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.	n (Obs)	Mean	Std. Dev.
ID=10	0							47	37.137870	86.802840	47	18.83915	69.49432	47	33.30574	86.80348
	1							4	21.615000	16.252520	4	-0.37	0.7795725	4	17.78	16.24771
	Diff								15.522870			19.209150			15.525740	
	Independent sample								t = 0.3540 p-value = 0.7249			t = 0.5477 p-value = 0.5864			t = 0.3540 p-value = 0.7284	
	Wilcoxon rank sum								z = -1.437 p-value = 0.1507			z = 1.507 p-value = 0.1319			z = -1.437 p-value = 0.1506	
ID=11	0							48	0.647500	1.241847	48	1.712500	7.084666	48	-8.170625	1.241798
	1							8	0.928750	1.320091	8	5.528750	15.025780	8	-7.887500	1.321771
	Diff								-0.281250			-3.816250			-0.283125	
	Independent sample								t = -0.5881 p-value = 0.5589			t = -1.1700 lue = 0.2471			t = -0.5920 p-value = 0.5564	
	Wilcoxon rank sum								z = -1.382 p-value = 0.1670			z = -0.316 p-value = 0.7519			z = -1.417 p-value = 0.1564	
ID=12	0							36	50.416670	86.874240	36	1.010556	2.922539	36	30.809440	86.875050
	1							2	138.395000	182.709300	2	-0.140000	0.905097	2	118.785000	182.709300
	Diff								-87.978330			1.150556			-87.975550	
	Independent sample								t = -1.3321 p-value = 0.1912			t = 0.5488 p-value = 0.5865			t = -1.3320 p-value = 0.1912	
	Wilcoxon rank sum								z = -0.784 p-value = 0.4328			z = 0.588 p-value = 0.5563			z = -0.785 p-value = 0.4327	
ID=13	0							37	38.575410	67.837290	37	0.545946	1.675829	37	15.435140	67.837380
	1							1	365.660000	n/a	1	-0.080000	n/a	1	342.520000	n/a
	Diff								-327.084600			0.625946			-327.084900	
	Independent sample								t = n/a p-value = n/a			t = n/a p-value = n/a			t = n/a p-value = n/a	
	Wilcoxon rank sum								z = -1.596 p-value = 0.1105			z = 0.046 p-value = 0.9636			z = -1.596 p-value = 0.1105	

The result from Table 5 above shows that two-week standard deviation of daily returns, P/E ratio, and turnover-related variables cannot explain the events of net settlement and/or margin trading prohibition of warrants. However, similar to the event of stocks, return factor using weekly returns and abnormal weekly returns may effectively explain the phenomenon of warrants.

With the limitation of statistical implication of independent test, the Tables 4 and 5 may not best explain the implication of all variables on individual security sample; especially for those stock IDs whose event week occurs only once as no standard deviation or the P-value can be estimated. However, an alternative approach is to apply the result from the Wilcoxon test to explain the event, which is more appropriate and more effective considering the limited number of samples that are used in the study. Hence, it can be seen that the Wilcoxon's z-test and p-values can be applied to replace the independent t-test and p-values that are not applicable for some variables.

The testing and result interpretation process includes the following steps:

1. Correlation test is conducted to verify that one or more variables that signify the same factor (volatility, return, liquidity) may be highly correlated. If the test finds a high correlation for such variables, they one or more problematic variables need to be excluded as the model cannot cope with multicollinearity problem.
2. Variables that may not be appropriate for the model and do not have explanatory ability will be excluded from the model.
3. The step 2 will be repeated until the McFadden R^2 of the model is reasonably high and the remaining variables can explain the model and the event. However, if the McFadden R^2 is insignificant in the results of several constructed models, I will focus the result only on the explanatory variables as the model may not be appropriate for the event explanation.
4. Test on percentage of prediction accuracy will be conducted to verify whether the model can correctly predict the future event based on the empirical study of historical data.

Results Interpretation

The result from testing both manipulated stocks and warrants together is illustrated and examined below:

- **Test of *both sample stocks and warrants***

Table 6 : Correlation Test of abnormality trading on both stocks and warrants

	y	x1_1	x3_1	x4_1	x8_1	x9_1	x10_1	d1_1	d4_1	d6_1
y	1.0000									
x1_1	0.1104	1.0000								
x3_1	0.3714	-0.1541	1.0000							
x4_1	0.3747	-0.1533	0.9849	1.0000						
x8_1	0.1796	0.0761	0.1685	0.1468	1.0000					
x9_1	0.0033	0.0941	0.0472	0.0432	0.0205	1.0000				
x10_1	0.1915	0.0991	0.1791	0.1597	0.9897	0.0343	1.0000			
d1_1	0.2698	0.1981	0.4620	0.4439	0.2050	0.0920	0.2054	1.0000		
d4_1	0.2295	-0.0132	0.4851	0.5232	0.1303	0.0406	0.1340	0.3462	1.0000	
d6_1	0.1707	0.0732	0.1714	0.1573	0.4831	-0.0305	0.4989	0.1232	0.1359	1.0000

From Table 6, only 9 independent and dummy variables from the total of 16 are selected for the synchronized test of models, to determine the variables that can potentially explain the manipulative events of both stocks and warrants, due to limitation of variables that can be applied to warrant-related tests.

The variables that are highly correlated are the pairs of X3 and X4, which are weekly returns and abnormal weekly returns. As these two variables signify the same factor, which relates to return of the security; therefore, only one of which should remain in the model. X8 and X10 are also highly correlated and has an implication on the similar factor, which is turnover or liquidity of the stock; hence, X8 in excluded from the model for a potential improvement in prediction accuracy. Moderate correlation also occurs for some variables that signify the factors of returns and liquidity, which is worth considering in variable selection for the most optimal model that may be most viable to describe the manipulative event. There are also some other variables that cannot well explain the market manipulation or abnormal trading activities, I then eliminate these inapplicable for a simplicity and reasonableness in interpretation of the model.

Table 7 : Correlation Test of abnormality trading on stocks only

	y	x1_1	x2_1	x3_1	x4_1	x5_1	x6_1	x7_1	x8_1	x9_1
y	1.0000									
x1_1	0.0957	1.0000								
x2_1	-0.0282	-0.0560	1.0000							
x3_1	0.3617	-0.2607	-0.0204	1.0000						
x4_1	0.3526	-0.2638	-0.0061	0.9819	1.0000					
x5_1	0.2657	0.1564	-0.0565	0.1723	0.1321	1.0000				
x6_1	0.0278	0.0247	-0.0251	-0.0364	-0.0518	0.1614	1.0000			
x7_1	0.2981	0.1742	-0.0191	0.2175	0.2114	0.8566	0.1850	1.0000		
x8_1	0.3036	0.1596	-0.0599	0.2145	0.1882	0.9218	0.1703	0.8685	1.0000	
x9_1	0.0432	0.0382	-0.0194	-0.0218	-0.0337	0.0972	0.9216	0.1188	0.0971	1.0000
x10_1	0.3186	0.1899	-0.0631	0.2215	0.1969	0.8917	0.1823	0.9113	0.9796	0.1104
d1_1	0.3727	0.1186	-0.0421	0.6125	0.6044	0.2705	0.0569	0.3242	0.3247	0.0540
d2_1	-0.0065	-0.0037	0.3764	-0.0155	-0.0091	-0.0526	-0.0313	0.0454	-0.0289	-0.0334
d3_1	0.2187	0.1709	-0.0933	0.2289	0.1873	0.5257	0.0743	0.3760	0.5628	0.0458
d4_1	0.1910	-0.0422	0.0082	0.4871	0.5377	0.0928	-0.0412	0.1979	0.1498	-0.0356
d5_1	0.2752	0.1776	-0.0704	0.2645	0.2451	0.5075	0.1074	0.5982	0.5797	0.0622
d6_1	0.2312	0.1925	-0.0778	0.2192	0.1974	0.4761	0.0827	0.5120	0.5386	0.0488

	x10_1	d1_1	d2_1	d3_1	d4_1	d5_1	d6_1
x10_1	1.0000						
d1_1	0.3457	1.0000					
d2_1	-0.0038	0.0212	1.0000				
d3_1	0.5301	0.3180	-0.0689	1.0000			
d4_1	0.1474	0.4040	-0.0517	0.1079	1.0000		
d5_1	0.6125	0.3428	0.0100	0.7275	0.1892	1.0000	
d6_1	0.5723	0.2955	0.0721	0.7022	0.1467	0.7841	1.0000

From Table 7, all independent and dummy variables of 16 are selected for the independent test of models, to determine the variables that can potentially explain the manipulative events of stocks only.

The variables that are highly correlated are the group of X1, X3 and X4, which are standard deviation of two-week daily abnormal returns, weekly returns and abnormal weekly returns. There is a slight dissimilarity from the joint test for stocks and warrants in that the volatility of the stock returns appears to be highly correlated with the return factors; however, only one of these variables should remain in the model as well depending on the significance of explanatory power. Other variables that represent the return factor are also moderately correlated as well as some of the variables that are grouped by the liquidity factor; hence,

some of these variables if not all that represent different factors will be excluded from the model for a potential improvement in prediction accuracy. X8 and X10 are also highly correlated and have an implication on the similar factor, which is turnover or liquidity of the stock; hence, X8 is excluded from the model in consistency with the model for joint test for a potential improvement in prediction accuracy. There are also some other variables that cannot well explain the market manipulation or abnormal trading activities that are eliminated from the model for simplification and a reasonableness interpretation of the model.

Table 8 : Correlation Test of abnormality trading on warrants only

	y	x1_1	x3_1	x4_1	x8_1	x9_1	x10_1	d1_1	d4_1	d6_1
y	1.0000									
x1_1	0.1134	1.0000								
x3_1	0.4032	-0.0885	1.0000							
x4_1	0.4214	-0.0749	0.9874	1.0000						
x8_1	0.0708	-0.0431	0.1413	0.1238	1.0000					
x9_1	-0.0249	0.0850	0.0740	0.0745	-0.0139	1.0000				
x10_1	0.0828	-0.0155	0.1545	0.1396	0.9947	0.0020	1.0000			
d1_1	0.1782	-0.1715	0.5237	0.4993	0.0565	0.0543	0.0515	1.0000		
d4_1	0.3208	0.0683	0.5364	0.5575	0.1421	0.1127	0.1528	0.5553	1.0000	
d6_1	0.0533	0.0031	0.1294	0.1197	0.5559	-0.0775	0.5525	0.0858	0.0956	1.0000

From Table 8, only 9 independent and dummy variables from the total of 16 are selected for the individual test of models, to determine the variables that can potentially explain the manipulative events of warrants only, due to limitation of variables that can be applied to warrant-related tests.

Consistent with the joint test of stocks and warrants and the individual test of stocks only, the variables that are highly and moderately correlated are the pairs of X3, X4, D1, and D4 which are weekly returns and abnormal weekly returns and dummy variables related to these independent variables. As these variables signify the same factor, which relates to return of the security; therefore, some of these should be excluded from the model. X8, X10, and D6 are also highly correlated and have an implication on the similar factor, which is turnover or liquidity of the stock; hence, some of the variables that represent similar factors are excluded from the model for a potential improvement in prediction accuracy. There are also some other variables that cannot well explain the market manipulation or abnormal trading activities considered eliminated for simplification and a realistic interpretation of the model.

Table 9 : Maximum likelihood estimates using logit model analysis on the determinant of Abnormal Trading (Manipulative Behavior)

Binary Logit Model (Abnormal Trading = 1, Otherwise = 0)

			All			Stocks			Warrants		
		Expected Sign	**Coefficient**	**t-statistic**	**p-value**	**Coefficient**	**t-statistic**	**p-value**	**Coefficient**	**t-statistic**	**p-value**
Dependent Variable: Y											
T=-1											
Two-week Standard Deviation on Daily Stock Returns	*X1_1*	+	-21.0697	(-2.94) *	0.003 *	-16.0687	(-1.36)	0.173	-38.1164	(-2.55) **	0.011 **
Abnormal Weekly Return	*X4_1*	+	6.9920	(5.09) *	0.000 *	6.5137	(3.88) *	0.000 *	11.0643	(2.95) *	0.003 *
% Change in Weekly Turnover	*X6_1*	+				0.0133	(0.24)	0.814			
% Change in Weekly Volume Turnover	*X9_1*	+	0.0033	(0.33)	0.740				-0.0090	(-0.23)	0.82
Abnormal Weekly Volume Turnover	*X10_1*	+	0.0069	(1.89) ***	0.059 ***	0.0196	(2.78) *	0.005 *	-0.0020	(-0.38)	0.706
T=-2											
Two-week Standard Deviation on Daily Stock Returns	*X1_2*	+	23.0971	(3.12) *	0.002 *	14.1142	(1.1.3)	0.259	34.0788	(2.36) **	0.018 **
Abnormal Weekly Return	*X4_2*	+	-0.5979	(-0.70)	0.485	-1.2258	(-0.86)	0.393	-0.8415	(-0.52)	0.605
% Change in Weekly Turnover	*X6_2*	+				-0.1271	(-1.37)	0.171			
% Change in Weekly Volume Turnover	*X9_2*	+	-0.0062	(-0.28)	0.778				0.0088	(0.29)	0.772
Abnormal Weekly Volume Turnover	*X10_2*	+	0.0009	(0.22)	0.826	0.0086	(1.20)	0.232	-0.0057	(-0.86)	0.388
T=-3											
Two-week Standard Deviation on Daily Stock Returns	*X1_3*	+	-12.7901	(-1.92) ***	0.055 ***	-8.5273	(-0.76)	0.444	-15.9620	(-1.43)	0.154
Abnormal Weekly Return	*X4_3*	+	1.8858	(2.66) *	0.008 *	2.7888	(1.69) ***	0.090 ***	1.5621	(1.59)	0.113
% Change in Weekly Turnover	*X6_3*	+				-0.0570	(-0.66)	0.511			
% Change in Weekly Volume Turnover	*X9_3*	+	-0.0734	(-0.97)	0.330				-0.3140	(-1.25)	0.211
Abnormal Weekly Volume Turnover	*X10_3*	+	0.0086	(2.23) **	0.026 **	0.0057	(0.80)	0.424	0.0186	(2.49) **	0.013 **
Loglikelihood Function			-76.877			-49.544			-20.084		
McFadden's R2			0.355			0.380			0.490		
Count R2			0.538			0.778			0.750		

*,**,*** Denote significance at 1, 5, and 10% levels, respectively

The Table 9 contains the final results from examining the most appropriate variables to represent each of the previously mentioned factors: volatility, return, and liquidity. Firstly, the test is to examine the variables that can mutually explain the relationship between the independent variables and both abnormally traded stocks and warrants. Thereafter, the test is separated into the study on abnormally traded stocks solely and another test is on only abnormally traded warrants.

The two-week standard deviation on daily stock returns represent volatility factor for all tests; the abnormal weekly returns represent the return factor for all tests; and abnormal weekly volume turnover represents the liquidity factor for all tests. However, the percentage change in weekly turnover is for liquidity factor for tests on stocks only and the percentage change in weekly volume turnover is for liquidity factor for tests on both securities together and on warrants only as the percentage in weekly turnover using the calculation of the SEC cannot be applied to tests on warrants as the free float information is not available for warrants.

The statistic results can be interpreted as follows:

For test on both securities together, volatility factor can explain the abnormal trading event using the lag time of -1, -2, and -3 at confident levels of 99, 99, and 90 percent respectively. Moreover, the return factor can explain the event using the lag time of -1 and -3 at confident levels of 99 percent for both periods. The liquidity factor represented by the abnormal weekly volume turnover can explain the event using the lag time of -1 and -3 at confident levels of 90 and 95 percent respectively. The direction of the coefficients that are significant to this model can be explained by the graphical illustration in Appendix F. Therefore, all factors can explain the event as partially suggested by the regulation of the SET. However, the McFadden's R2, which refers to the goodness of fit test, is as insignificant as 0.355. Therefore, we may conclude that with a limited number of samples, the results from this model may not be applied to all securities in the market.

For test on abnormally traded stocks only, the return factor can explain the abnormal trading behavior using the lag time of -1 and -3 at confident levels of 99 and 90 percent respectively. The liquidity factor represented by the abnormal volume turnover can explain the event using the lag time of -1 at a confident level of 99 percent. The direction of the coefficients that are significant to this model can also be explained by the graphical illustration. It may be noted that volatility factor is insignificant in explaining the model for stocks only. Overall for the model of stocks only, McFadden's R^2 suggests that this model may not be highly

appropriate for the test; however, the value of McFadden's R^2 is at 0.38, which is slightly higher than the one for tests on both stocks and warrants together. Thus, it may be more appropriate to apply this model than the model for both stocks and warrants in spite of the insignificant McFadden's R^2 value.

For test on abnormally traded warrants only, the volatility factor can explain the event using the lag time of -1 and -2 at 95 percent confident levels for both periods. The return factor can explain the event using the lag time of -1 at a 99 percent confident level; and the liquidity factor represented by the abnormal weekly volume turnover using the lag time of -3 at a 95 percent confident level. As for the direction of coefficients of variables that are deemed significant in the model, it can be explained using the graphs in the Appendix F. In conformity with the hypotheses, all three factors can explain the event at a different level of confidence at a different time period. The value of McFadden's R^2 is relatively high for this model compared to the ones relevant to the tests of both securities together and the tests of stocks only although it may be suggested that it is not significant enough to effectively explain the event in general for all warrants in the Thai market.

Table 10 : Summary of abnormal trading prediction using the Logit model

	Predicted		
Actual	Non-abnormal Trading	Abnormal Trading	**Total**
All			
Non-abnormal Trading	572	1	573
Abnormal Trading	32	6	38
Total	604	7	611
Stocks Only			
Non-abnormal Trading	412	1	413
Abnormal Trading	22	3	25
Total	434	4	438
Warrants Only			
Non-abnormal Trading	160	0	160
Abnormal Trading	10	3	13
Total	170	3	173

Table 10 above can be interpreted that the percentage of accurate prediction for the model of both securities is at approximately 16 percent. The percentage of accurate prediction for the models of stocks only and warrants only are approximately 12 and 23 percent respectively. The table implies that on average, the prediction is more efficient when the securities are tested separately that when they are jointly tested. Moreover the prediction error for the joint test can be a result of prediction error appears in the test for stocks only as there is no error for the test on warrants only. The higher percentage of accuracy for test on warrants only may come from the small number of samples compared to other tests.

VI. Conclusion, Limitation, and Recommendation

CONCLUSION

From the empirical results in Section V, it can be concluded that the model is more accurate in predicting the manipulative events for individual securities rather than the joint test as there may be certain characteristics that differentiate the monitor of the SET on warrants and on stocks. Therefore the test on both securities together does not effectively provide an indication that the selected variables are able to explain the phenomenon; in addition, inclusion of stocks in the joint test together with the warrants worsens the overall result as the percentage of accurate prediction declines for the joint test compared to the separate test for warrants. Moreover, due to a larger number of samples for stock testing compared to that for warrant testing, the result of joint test may be dominated by the result from the test on stocks. This paper may be summarized, coherently based on the results from the Univariate and Wilcoxon tests, Logit model, and graphs, that standard deviation vaguely explains the event while the focus of this paper, return and liquidity are much more effective in explaining the events through abnormal weekly returns and both types of abnormal weekly turnover respectively. The sign of coefficients can be clearly explained by the graphs in the Appendix F. However, the highest percentage of accurate prediction on warrant tests may be a result of the smallest number of samples. The results in Table 9 suggest that the all three factors can be applied in testing the models for all securities together and warrants only. However, the volatility factor cannot effectively explain the phenomenon of only stocks. The explanation for such finding is that there is an event of NNCL that causes an unusually substantial rise in standard deviation, which potentially reduces the significance in the effect of the volatility factor on average for the event week as presented in Appendix F. Mostly, return factor and liquidity factor represented by abnormal weekly volume turnover are significant in all tested scenarios. We may conclude that in conformity with the SET's regulation, both factors do have an effect on the net settlement and/or margin trading prohibition.

Being consistent with the Univariate and Wilcoxon tests, both return and liquidity factors can explain significant parts of the events except that the liquidity factors do not appear to be significant in explaining the phenomenon of only warrants.

As illustrated in Appendix F, after the net settlement and/or margin trading prohibition, it is obvious that the magnitude of most quantitative variables is declined from the previous

period although magnitude of some variables may start to decline prior to the announcement. Therefore, this may suggest that the abnormal trading is highly relevant to trades that are dependent on the net settlement and margin loan allowance. The result also suggests that the announcement of the SET does have an effect on cooling down the trading behavior of the investors.

The result from this study may not be generalized for the forecast of the Thai capital market until there is a future study which takes into account the examination of a larger number of abnormally traded sample securities.

LIMITATION

There is number limitations applied to this study, which mostly relate to the absence of the quantitative and qualitative data to conduct explain the concept of behavioral finance in stock price manipulation in depth.

The manipulation will take place and can be easily detected during the trading hours of the day. However, according to the regulations of the SET, the tick-by-tick stock price data or so called “intraday data” is not publicly available at the time that this study is commenced. Therefore, the only accessible data for normal investors are the daily data such as daily closing prices, P/E ratio, market capitalization, free float data, market trading value and trading volume, which may to some extent imply the manipulation although not as apparent. As an alternative, some of the publicly available data such as weekly turnover list is also provided by the SEC for the purpose of providing notice to investors of the dubious market activities in relation to security turnover, which has proven to be true for the Thai market, except that the turnover calculation of the SEC does not show a close relationship with the criteria used by the SET to enforce non-cash trading prohibition. This study focuses on only selected independent variables that represent the factors identified by the SET to be directly relevant to the net settlement and/or margin trading prohibition. Some of these variables are also widely used in explaining the other international stock markets.

One of the variables that are examined in this study is abnormal return. There are several approaches to derive the expected return; however, only the Market model is applied in this context as it better reflects the specific risk of the listed firms in comparison to the return of the market than other approaches. Due to the application of this model, three stocks and one warrant are excluded from the dataset as there is limitation on the historical data of these stocks with regard to the estimation period as defined in the Section IV.

This paper applies the Logit model using only the pseudo panel data and does not focus on the cross-sectional analysis. The extensive sample data is required for such analysis by collecting the large database of security-related variables for all the firms in the market. Such analysis may experience the same data limitation problems as the Thai capital market is not as liquid as foreign markets. The researcher may find that there are many non-trading days for certain securities; therefore, the sample size may have to be substantially reduced from the whole market.

I have experienced another limitation of applying the Logit model on pseudo panel data in that the STATA program leaves out the observations of stock IDs that are not manipulated (all Y=0). Therefore, only stocks that contain at least 1 observation where Y=1 will be analyzed. This study then concentrates on comparison of the time series of the securities that have been prohibited from non-cash trading. Another conclusion may be drawn that pseudo panel or panel data analysis using the Logit model is not appropriate for the tests, which are conducted on a small dataset.

RECOMMENDATION FOR FURTHER STUDY

Another approach that may be more appropriate than using to Logit model is a modification of a statistical method, called survival analysis, which is widely used in medical and engineering fields and has increase in popularity of application in the economics field. The survival analysis is suggested for further study of capital market manipulation in Thailand. According to Yu (2004), the survival analysis is also known as time to event analysis. It attempts to estimate the fraction of a population that survives the past event and the percentage that they fail or survive. The analysis also takes into account the multiple causes of that past event. The methodology also attempts to answer the factors that have an effect on the change the odds of survival the event. This is considered a very intriguing approach to be applied to the capital market.

Another option that may also be feasible is to continue using the Logit model in examining the manipulation event, the cross-sectional analysis is suggested where the researcher essentially accumulates an extensive amount of data. This approach may help answer the relationship between different means of variables in comparison to those of the market. This is another study focusing on different perspectives from the current study, which merely focuses on the historical performances of securities in question. Due to a larger sample size, the model may be able to provide a more generalized explanation for the manipulative events of the Thai capital market.

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Appendices

Appendix A

Reference to Clause 3 of **the Regulations of the Stock Exchange of Thailand; Re: Measures in Case of Abnormality in the Trading of Securities on the Exchange, 2001, Dated August 29, 2001**

"Clause 3. When the Board of Governors is of the view that the position of the trading of any securities on the Exchange is likely to cause adverse effect on the overall trading position due to a drastic change in the price or trading volume of such securities, or a high concentration of the trading in such securities, the Board of Governors is empowered to temporarily prohibit the members from trading in such securities in the following manners:

(1) the trading by means of offsetting the purchasing prices and selling prices of the same securities on the same day;
(2) the trading in which a member provides a margin to its clients for purchasing securities;
(3) the sale of securities in which the securities must be borrowed for settlement purpose."

Appendix B

NOTIFICATION OF THE STOCK EXCHANGE OF THAILAND

Re: Preparation and Submission of Net Settlement Securities Trading Transaction Report, 2004

By virtue of Clause 8/1 of the Regulations of the Stock Exchange of Thailand Re: Rules and Procedures Relating to Securities Trading in Cash dated January 14, 1997 the Stock Exchange of Thailand amended by the Regulations of the Stock Exchange of Thailand Re: Rules and Procedures relating to Securities Trading in Cash (No.4), B.E. 2547 (A.D. 2004) dated May 17, 2004 the Stock Exchange of Thailand hereby issues the following Regulations:

1. This Notification shall come into force on July 1, 2004. — effectiveness

2. Notification of the Stock Exchange of Thailand Re: Preparation and Submission of Same-Day Securities Trading Transaction Report, 2003 dated November 23, 2003 shall be repealed. — repealing provision

3. A member shall prepare the Net Settlement securities trading transaction report both for a daily report and biweekly report. — daily report

4. A member shall prepare a daily report showing Net Settlement securities trading transaction, which has the following details. — the details of daily report

(1) customer's name;

(2) securities' name;

(3) amount of securities;

(4) purchasing and sales price;

(5) total purchasing and sales value;

(6) total purchasing value and sales value of equivalent unit of securities;

(7) net value of equivalent unit of securities.

5. A member shall prepare and submit a biweekly report of Net Settlement securities trading transaction (Net Settlement) in the form attached hereto to the Exchange within 7 days after the 15th and the last day of each month. — the report of securities trading

Notified on this17th day of May, 2004.

(Signed) Kittirat Na-Ranong

(Mr. Kittirat Na-Ranong)
President

Rationale of Notification: For the purpose of examining and monitoring the trading of securities by customers who trade securities by means of Net Settlement securities trading transaction, it is appropriate to issue this Notification.

Appendix C

All result tables on Logit models with different variables applied under different conditions.

All

1st run

```
. xtlogit y x1_1 x3_1 x4_1 x8_1 x9_1 x10_1 d1_1 d4_1 d6_1 x1_2 x3_2 x4_2 x8_2 x9_2 x10_2 d1_2 d4_2
d6_2 x1_3 x3_3 x4_3 x8_3 x9_3 x10_3 d1_3 d4_3 d6_3, fe nolog
note: multiple positive outcomes within groups encountered.

Conditional fixed-effects logistic regression   Number of obs      =       617
Group variable (i): id                          Number of groups   =        13

                                                Obs per group: min =        36
                                                               avg =      47.5
                                                               max =        65

                                                LR chi2(27)        =    121.89
Log likelihood  = -58.262295                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        x1_1 |  -19.67807   8.493187    -2.32   0.021    -36.32441   -3.031726
        x3_1 |   3.015521   7.363989     0.41   0.682    -11.41763    17.44867
        x4_1 |   1.802501    7.38879     0.24   0.807    -12.67926    16.28426
        x8_1 |   81.89023   62.23904     1.32   0.188    -40.09605    203.8765
        x9_1 |    .012574   .0106806     1.18   0.239    -.0083596    .0335076
       x10_1 |  -81.88648   62.23915    -1.32   0.188     -203.873    40.10001
        d1_1 |   .3160737   .6874611     0.46   0.646    -1.031325    1.663473
        d4_1 |   2.050544   .8599889     2.38   0.017     .3649968    3.736091
        d6_1 |    1.14537    .815668     1.40   0.160    -.4533095     2.74405
        x1_2 |   29.73331   10.49359     2.83   0.005     9.166257    50.30036
        x3_2 |  -9.324768   7.967569    -1.17   0.242    -24.94092     6.29138
        x4_2 |   11.68679    8.23667     1.42   0.156    -4.456787    27.83037
        x8_2 |   131.2536   65.03789     2.02   0.044     3.781626    258.7255
        x9_2 |   .0160658   .0175815     0.91   0.361    -.0183933    .0505248
       x10_2 |  -131.2512   65.03815    -2.02   0.044    -258.7236   -3.778768
        d1_2 |  -.0620224   .7863774    -0.08   0.937    -1.603294    1.479249
        d4_2 |  -1.876135   .7872343    -2.38   0.017    -3.419086   -.3331842
        d6_2 |   .8720248   .7717732     1.13   0.259    -.6406228    2.384672
        x1_3 |  -20.14176   9.030255    -2.23   0.026    -37.84073   -2.442785
        x3_3 |  -9.617354   8.586546    -1.12   0.263    -26.44668    7.211967
        x4_3 |   9.094816   8.528735     1.07   0.286    -7.621198    25.81083
        x8_3 |    79.8795   67.46677     1.18   0.236    -52.35294    212.1119
        x9_3 |  -.1051324   .0820713    -1.28   0.200    -.2659893    .0557245
       x10_3 |  -79.87637   67.46555    -1.18   0.236    -212.1064    52.35368
        d1_3 |   .3649752   .6664283     0.55   0.584    -.9412002    1.671151
        d4_3 |   .9488446   .6940695     1.37   0.172    -.4115066    2.309196
        d6_3 |   2.618344   .8988312     2.91   0.004     .8566674    4.380021
------------------------------------------------------------------------------

. fitstat, dif

Measures of Fit for clogit of y

(Multiple outcomes per group for clogit: Count R2 may not be valid)
Log-Lik Intercept Only:     -119.207     Log-Lik Full Model:          -58.262
D(-14):                      116.525     LR(27):                      121.889
                                         Prob > LR:                     0.000
McFadden's R2:                 0.511     McFadden's Adj R2:             0.285
Maximum Likelihood R2:         1.000     Cragg & Uhler's R2:            1.000
Count R2:                      0.057
AIC:                          13.117     AIC*n:                       170.525
BIC:                         152.434     BIC':                        -52.635
```

2nd run

```
. xtlogit y x1_1 x4_1 x9_1 x10_1 d1_1 d4_1 d6_1 x1_2 x4_2 x9_2 x10_2 d1_2 d4_2 d6_2 x1_3 x4_3 x9_3
x10_3 d1_3 d4_3 d6_3, fe nolog
note: multiple positive outcomes within groups encountered.

Conditional fixed-effects logistic regression   Number of obs      =       617
Group variable (i): id                          Number of groups   =        13

                                                Obs per group: min =        36
```

```
                                                        avg =      47.5
                                                        max =        65

                                              LR chi2(21)       =    113.00
Log likelihood  = -62.708962                  Prob > chi2       =    0.0000

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        x1_1 |  -14.28994   7.356883    -1.94   0.052    -28.70916    .1292907
        x4_1 |   3.702502   1.576666     2.35   0.019     .6122923    6.792711
        x9_1 |   .0071539   .0119109     0.60   0.548     -.016191    .0304987
       x10_1 |   .0039375   .0035738     1.10   0.271    -.0030671    .0109421
        d1_1 |   .3637573   .6390691     0.57   0.569    -.8887951     1.61631
        d4_1 |   2.053482   .8094744     2.54   0.011     .4669409    3.640022
        d6_1 |   .8948175   .7440102     1.20   0.229    -.5634156    2.353051
        x1_2 |   24.88366   9.151282     2.72   0.007     6.947474    42.81984
        x4_2 |   1.886591   1.442584     1.31   0.191    -.9408222    4.714005
        x9_2 |   .0066387   .0219433     0.30   0.762    -.0363693    .0496467
       x10_2 |   .0028252    .004331     0.65   0.514    -.0056634    .0113137
        d1_2 |  -.4896119   .7006046    -0.70   0.485    -1.862772    .8835479
        d4_2 |  -1.322207   .6916056    -1.91   0.056    -2.677729    .0333153
        d6_2 |   .5941167   .7355059     0.81   0.419    -.8474485    2.035682
        x1_3 |  -16.04111   8.084915    -1.98   0.047    -31.88725   -.1949646
        x4_3 |  -.2490214   .9913302    -0.25   0.802    -2.191993     1.69395
        x9_3 |  -.0885728   .0774725    -1.14   0.253    -.2404161    .0632705
       x10_3 |   .0022252   .0045557     0.49   0.625    -.0067038    .0111541
        d1_3 |   .0866207   .6150508     0.14   0.888    -1.118857    1.292098
        d4_3 |   .9746878    .645465     1.51   0.131    -.2904004    2.239776
        d6_3 |   2.247661   .7810778     2.88   0.004     .7167764    3.778545
------------------------------------------------------------------------------

. fitstat, dif

Measures of Fit for clogit of y

(Multiple outcomes per group for clogit: Count R2 may not be valid)
Log-Lik Intercept Only:     -119.207     Log-Lik Full Model:          -62.709
D(-8):                       125.418     LR(21):                     112.995
                                         Prob > LR:                    0.000
McFadden's R2:                 0.474     McFadden's Adj R2:            0.298
Maximum Likelihood R2:         1.000     Cragg & Uhler's R2:           1.000
Count R2:                      0.615
AIC:                          12.878     AIC*n:                      1
67.418
BIC:                         145.938     BIC':                       -59.131
```

3rd run

```
. xtlogit y x1_1 x4_1 x9_1 x10_1 x1_2 x4_2 x9_2 x10_2 x1_3 x4_3 x9_3 x10_3 , fe nolog
note: multiple positive outcomes within groups encountered.

Conditional fixed-effects logistic regression   Number of obs      =       617
Group variable (i): id                          Number of groups   =        13

                                                Obs per group: min =        36
                                                               avg =      47.5
                                                               max =        65

                                                LR chi2(12)       =     84.66
Log likelihood  = -76.877206                    Prob > chi2       =    0.0000

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        x1_1 |  -21.06972   7.157597    -2.94   0.003    -35.09835   -7.041087
        x4_1 |   6.992028   1.374706     5.09   0.000     4.297653    9.686404
        x9_1 |   .0032784   .0098686     0.33   0.740    -.0160636    .0226204
       x10_1 |   .0069318   .0036692     1.89   0.059    -.0002596    .0141232
        x1_2 |   23.09707   7.405134     3.12   0.002     8.583274    37.61086
        x4_2 |  -.5979312   .8560219    -0.70   0.485    -2.275703    1.079841
        x9_2 |  -.0061945   .0219355    -0.28   0.778    -.0491874    .0367983
       x10_2 |   .0009231   .0041931     0.22   0.826    -.0072952    .0091414
        x1_3 |  -12.79014   6.664901    -1.92   0.055     -25.8531    .2728258
        x4_3 |   1.885816   .7091869     2.66   0.008     .4958354    3.275797
        x9_3 |  -.0734203   .0754133    -0.97   0.330    -.2212277    .0743871
       x10_3 |   .0085651   .0038469     2.23   0.026     .0010254    .0161049
------------------------------------------------------------------------------

. fitstat, dif

Measures of Fit for clogit of y

(Multiple outcomes per group for clogit: Count R2 may not be valid)
Log-Lik Intercept Only:     -119.207     Log-Lik Full Model:          -76.877
```

```
D(1):                         153.754     LR(12):                        84.659
                                          Prob > LR:                      0.000
McFadden's R2:                  0.355     McFadden's Adj R2:              0.254
Maximum Likelihood R2:          0.999     Cragg & Uhler's R2:             0.999
Count R2:                       0.538
AIC:                           13.673     AIC*n:                        177.754
BIC:                          151.189     BIC':                         -53.880

. tabulate y yhat if time>2

           |         yhat
         Y |         0          1 |     Total
-----------+----------------------+----------
         0 |       572          1 |       573
         1 |        32          6 |        38
-----------+----------------------+----------
     Total |       604          7 |       611
```

Stocks

1st run

```
. xtlogit y x1_1 x2_1 x4_1 x6_1 x10_1 d2_1 d3_1 d4_1 d5_1 d6_1 x1_2 x2_2 x4_2 x6_2 x10_2 d2_2 d3_2
d4_2 d5_2 d6_2 x1_3 x2_3 x4_3 x6_3 x10_3 d2_3 d3_3 d4_3 d5_3 d6_3 if id<10, fe nolog
note: multiple positive outcomes within groups encountered.

Conditional fixed-effects logistic regression   Number of obs      =       442
Group variable (i): id                          Number of groups   =         9

                                                Obs per group: min =        47
                                                               avg =      49.1
                                                               max =        65

                                                LR chi2(30)        =     85.88
Log likelihood  = -36.905594                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        x1_1 |  -25.12527   14.87989    -1.69   0.091    -54.28932    4.038767
        x2_1 |  -.0235567   .0218761    -1.08   0.282    -.0664331    .0193197
        x4_1 |   3.503096   2.342911     1.50   0.135    -1.088925    8.095117
        x6_1 |   .0275438   .0974417     0.28   0.777    -.1634384     .218526
       x10_1 |   .0106142   .0083875     1.27   0.206     -.005825    .0270534
        d2_1 |   4.662917   3.218135     1.45   0.147    -1.644513    10.97035
        d3_1 |  -2.042936   1.395722    -1.46   0.143    -4.778502    .6926298
        d4_1 |   2.278598   1.246876     1.83   0.068    -.1652351     4.72243
        d5_1 |   2.372339   1.377221     1.72   0.085    -.3269653    5.071644
        d6_1 |   1.539731   1.214697     1.27   0.205    -.8410313    3.920493
        x1_2 |   34.33906   17.88992     1.92   0.055    -.7245509    69.40266
        x2_2 |  -.0085558   .0202899    -0.42   0.673    -.0483231    .0312116
        x4_2 |   2.627471     2.4364     1.08   0.281    -2.147784    7.402727
        x6_2 |   .0149578   .0689053     0.22   0.828     -.120094    .1500097
       x10_2 |   .0088416   .0082705     1.07   0.285    -.0073682    .0250514
        d2_2 |  -2.337473   3.709396    -0.63   0.529    -9.607756     4.93281
        d3_2 |  -.6756555   1.232296    -0.55   0.583    -3.090911      1.7396
        d4_2 |   -1.99769   1.078732    -1.85   0.064    -4.111967    .1165865
        d5_2 |  -1.044617   1.412235    -0.74   0.459    -3.812547    1.723314
        d6_2 |   1.685772   1.218616     1.38   0.167    -.7026713    4.074215
        x1_3 |  -45.07471   19.61354    -2.30   0.022    -83.51655   -6.632877
        x2_3 |   -.000259   .0026913    -0.10   0.923    -.0055339    .0050158
        x4_3 |  -.1238089   2.665094    -0.05   0.963    -5.347297    5.099679
        x6_3 |  -.1222425   .1235117    -0.99   0.322     -.364321    .1198359
       x10_3 |   .0062268   .0099046     0.63   0.530    -.0131858    .0256394
        d2_3 |   2.610408   2.784673     0.94   0.349    -2.847452    8.068267
        d3_3 |   1.697102   1.292001     1.31   0.189    -.8351734    4.229377
        d4_3 |    .599569   .9669349     0.62   0.535    -1.295589    2.494727
        d5_3 |  -.4280143   1.232298    -0.35   0.728    -2.843275    1.987246
        d6_3 |   2.321632   1.161653     2.00   0.046     .0448334    4.598431
------------------------------------------------------------------------------
```

2nd run

```
. xtlogit y x1_1 x2_1 x4_1 x6_1 x10_1 d2_1 d3_1 d4_1 x1_2 x2_2 x4_2 x6_2 x10_2 d2_2 d3_2 d4_2 x1_3
x2_3 x4_3
>  x6_3 x10_3 d2_3 d3_3 d4_3 if id<10, fe nolog
note: multiple positive outcomes within groups encountered.

Conditional fixed-effects logistic regression   Number of obs      =       442
Group variable (i): id                          Number of groups   =         9

                                                Obs per group: min =        47
```

```
                                                              avg =      49.1
                                                              max =        65

                                              LR chi2(24)        =     74.34
Log likelihood  = -42.674512                  Prob > chi2        =    0.0000

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        x1_1 |  -15.32216    13.2541    -1.16   0.248    -41.29972    10.65539
        x2_1 |  -.0125874   .0163325    -0.77   0.441    -.0445986    .0194238
        x4_1 |   3.384643   2.168574     1.56   0.119    -.8656838    7.634969
        x6_1 |   .0420255   .0553156     0.76   0.447     -.066391     .150442
       x10_1 |   .0159565   .0070491     2.26   0.024     .0021406    .0297725
        d2_1 |   2.339413   2.322421     1.01   0.314    -2.212448    6.891274
        d3_1 |   .6615319   .9230837     0.72   0.474    -1.147679    2.470743
        d4_1 |   1.531661   .9406274     1.63   0.103    -.3119347    3.375257
        x1_2 |   22.98971   15.53011     1.48   0.139    -7.448749    53.42817
        x2_2 |  -.0086386   .0175191    -0.49   0.622    -.0429755    .0256983
        x4_2 |    1.71216   2.159389     0.79   0.428    -2.520164    5.944485
        x6_2 |  -.0032546   .0548035    -0.06   0.953    -.1106675    .1041583
       x10_2 |   .0077131   .0076113     1.01   0.311    -.0072048     .022631
        d2_2 |  -.2680366   2.708562    -0.10   0.921     -5.57672    5.040646
        d3_2 |  -.3923467   .9256681    -0.42   0.672    -2.206623    1.421929
        d4_2 |   -1.57532   .9446978    -1.67   0.095    -3.426894    .2762538
        x1_3 |  -27.98747   15.39918    -1.82   0.069     -58.1693    2.194364
        x2_3 |   -.000565   .0032696    -0.17   0.863    -.0069733    .0058434
        x4_3 |   .2647334   2.311361     0.11   0.909    -4.265451    4.794918
        x6_3 |  -.0860579   .0996717    -0.86   0.388    -.2814107     .109295
       x10_3 |   .0065571   .0080397     0.82   0.415    -.0092004    .0223146
        d2_3 |   1.599835     2.0961     0.76   0.445    -2.508446    5.708115
        d3_3 |   2.422736   .9203611     2.63   0.008     .6188617    4.226611
        d4_3 |   .5411887   .8632948     0.63   0.531    -1.150838    2.233215
------------------------------------------------------------------------------

. fitstat, dif

Measures of Fit for clogit of y

(Multiple outcomes per group for clogit: Count R2 may not be valid)
Log-Lik Intercept Only:      -79.847     Log-Lik Full Model:          -42.675
D(-15):                       85.349     LR(24):                       74.344
                                         Prob > LR:                     0.000
McFadden's R2:                 0.466     McFadden's Adj R2:             0.165
Maximum Likelihood R2:         1.000     Cragg & Uhler's R2:            1.000
Count R2:                      0.667
AIC:                          14.817     AIC*n:                       133.349
BIC:                         118.307     BIC':                        -21.611
```

3rd run

```
. xtlogit y x1_1 x4_1 x6_1 x10_1 x1_2 x4_2 x6_2 x10_2 x1_3 x4_3 x6_3 x10_3 if id<10, fe nolog
note: multiple positive outcomes within groups encountered.

Conditional fixed-effects logistic regression   Number of obs      =       442
Group variable (i): id                          Number of groups   =         9

                                                Obs per group: min =        47
                                                               avg =      49.1
                                                               max =        65

                                                LR chi2(12)        =     60.61
Log likelihood  = -49.543748                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        x1_1 |  -16.06871     11.789    -1.36   0.173    -39.17473     7.03731
        x4_1 |   6.513737   1.680599     3.88   0.000     3.219823     9.80765
        x6_1 |   .0133321   .0566097     0.24   0.814    -.0976207     .124285
       x10_1 |   .0195792     .00705     2.78   0.005     .0057614    .0333969
        x1_2 |   14.11416   12.50301     1.13   0.259    -10.39129    38.61962
        x4_2 |  -1.225833   1.433718    -0.86   0.393    -4.035868    1.584202
        x6_2 |  -.1270931   .0929162    -1.37   0.171    -.3092056    .0550193
       x10_2 |   .0086465   .0072342     1.20   0.232    -.0055322    .0228252
        x1_3 |  -8.527259   11.15033    -0.76   0.444     -30.3815    13.32698
        x4_3 |   2.788756   1.646775     1.69   0.090    -.4388646    6.016376
        x6_3 |  -.0569501   .0865972    -0.66   0.511    -.2266775    .1127773
       x10_3 |   .0057325   .0071765     0.80   0.424    -.0083332    .0197981
------------------------------------------------------------------------------

. fitstat, dif
```

```
Measures of Fit for clogit of y

(Multiple outcomes per group for clogit: Count R2 may not be valid)
Log-Lik Intercept Only:      -79.847     Log-Lik Full Model:          -49.544
D(-3):                        99.087     LR(12):                       60.606
                                         Prob > LR:                     0.000
McFadden's R2:                 0.380     McFadden's Adj R2:             0.229
Maximum Likelihood R2:         0.999     Cragg & Uhler's R2:            0.999
Count R2:                      0.778
AIC:                          13.676     AIC*n:                       123.087
BIC:                         105.679     BIC':                        -34.239



. tabulate y yhat if time>2 & id<10

           |         yhat
         Y |         0          1 |     Total
-----------+----------------------+----------
         0 |       412          1 |       413
         1 |        22          3 |        25
-----------+----------------------+----------
     Total |       434          4 |       438
```

Warrants

1st run

```
. xtlogit y x1_1 x4_1 x9_1 x10_1 x1_2 x4_2 x9_2 x10_2 x1_3 x4_3 x9_3 x10_3 if id>9, fe nolog
note: multiple positive outcomes within groups encountered.

Conditional fixed-effects logistic regression   Number of obs      =       175
Group variable (i): id                          Number of groups   =         4

                                                Obs per group: min =        36
                                                               avg =      43.8
                                                               max =        54

                                                LR chi2(12)        =     38.55
Log likelihood  = -20.084433                    Prob > chi2        =    0.0001

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        x1_1 |  -38.11635   14.92679    -2.55   0.011    -67.37233   -8.860379
        x4_1 |   11.06434   3.746174     2.95   0.003      3.72197    18.4067
        x9_1 |  -.0089846   .0393751    -0.23   0.820    -.0861585    .0681893
       x10_1 |  -.0019585    .005188    -0.38   0.706    -.0121269    .0082098
        x1_2 |   34.07879   14.45823     2.36   0.018     5.741189    62.4164
        x4_2 |  -.8415297   1.626433    -0.52   0.605     -4.02928    2.346221
        x9_2 |   .0088312   .0304293     0.29   0.772    -.0508092    .0684716
       x10_2 |  -.0057466    .006654    -0.86   0.388    -.0187882    .0072951
        x1_3 |    -15.962   11.19922    -1.43   0.154    -37.91208    5.988071
        x4_3 |   1.562114   .9855168     1.59   0.113    -.3694636    3.493691
        x9_3 |  -.3140045   .2512766    -1.25   0.211    -.8064975    .1784885
       x10_3 |    .018642   .0074945     2.49   0.013      .003953    .0333309
------------------------------------------------------------------------------

. fitstat, dif

Measures of Fit for clogit of y

(Multiple outcomes per group for clogit: Count R2 may not be valid)
Log-Lik Intercept Only:      -39.360     Log-Lik Full Model:          -20.084
D(-8):                        40.169     LR(12):                       38.551
                                         Prob > LR:                     0.000
McFadden's R2:                 0.490     McFadden's Adj R2:             0.185
Maximum Likelihood R2:         1.000     Cragg & Uhler's R2:            1.000
Count R2:                      0.750
AIC:                          16.042     AIC*n:                        64.169
BIC:                          51.259     BIC':                        -21.915
```

Appendix D

Results from Univariate tests using STATA 9.0

ID1

```
. ttest x1_1 if id==1, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    .0571739    .0052074    .0353184    .0466856    .0676622
       1 |       4         .11           0           0         .11         .11
---------+--------------------------------------------------------------------
combined |      50       .0614     .005206    .0368123    .0509381    .0718619
---------+--------------------------------------------------------------------
    diff |           -.0528261    .0178264               -.0886684   -.0169838
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.9634
Ho: diff = 0                                     degrees of freedom =       48

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0024         Pr(|T| > |t|) = 0.0047          Pr(T > t) = 0.9976

. ttest x2_1 if id==1, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    39.45326    15.45372    104.8122     8.32788    70.57864
       1 |       4           0           0           0           0           0
---------+--------------------------------------------------------------------
combined |      50      36.297    14.28686    101.0233    7.586486    65.00752
---------+--------------------------------------------------------------------
    diff |            39.45326    52.90218               -66.9137    145.8202
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.7458
Ho: diff = 0                                     degrees of freedom =       48

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.7703         Pr(|T| > |t|) = 0.4594          Pr(T > t) = 0.2297

. ttest x3_1 if id==1, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46   -.0056522    .0235736     .159884   -.0531319    .0418275
       1 |       4       .5075    .0967277    .1934554    .1996693    .8153308
---------+--------------------------------------------------------------------
combined |      50       .0354    .0301807    .2134097   -.0252504    .0960504
---------+--------------------------------------------------------------------
    diff |           -.5131522    .0845453               -.6831418   -.3431625
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -6.0696
Ho: diff = 0                                     degrees of freedom =       48

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000

. ttest x4_1 if id==1, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    .0023913    .0233751    .1585375   -.0446885    .0494711
       1 |       4        .515    .0926013    .1852026    .2203013    .8096987
---------+--------------------------------------------------------------------
combined |      50       .0434    .0299722    .2119358   -.0168315    .1036315
---------+--------------------------------------------------------------------
    diff |           -.5126087    .0835799               -.6806574     -.34456
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -6.1332
Ho: diff = 0                                     degrees of freedom =       48
```

```
    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000

. ttest x5_1 if id==1, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    21.53696    7.215151    48.93554    7.004896    36.06902
       1 |       4       64.35     19.4212    38.84241    2.543064    126.1569
---------+--------------------------------------------------------------------
combined |      50      24.962    6.970269    49.28724    10.95472    38.96928
---------+--------------------------------------------------------------------
    diff |           -42.81304    25.21276               -93.5067    7.880609
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.6981
Ho: diff = 0                                     degrees of freedom =       48

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0480         Pr(|T| > |t|) = 0.0960          Pr(T > t) = 0.9520
. ttest x6_1 if id==1, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    2.805652    1.595389    10.82046   -.4076266    6.018931
       1 |       4         -.3    .1007472    .2014944   -.6206226    .0206226
---------+--------------------------------------------------------------------
combined |      50      2.5572    1.471403    10.40439   -.3996956    5.514096
---------+--------------------------------------------------------------------
    diff |            3.105652    5.461505               -7.875439    14.08674
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.5686
Ho: diff = 0                                     degrees of freedom =       48

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.7139         Pr(|T| > |t|) = 0.5722          Pr(T > t) = 0.2861

. ttest x7_1 if id==1, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    .1554346    7.215175     48.9357   -14.37667    14.68754
       1 |       4      42.965    19.42027    38.84055   -18.83898     104.769
---------+--------------------------------------------------------------------
combined |      50      3.5802    6.970245    49.28707   -10.42703    17.58743
---------+--------------------------------------------------------------------
    diff |           -42.80957    25.21279               -93.50328    7.884152
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.6979
Ho: diff = 0                                     degrees of freedom =       48

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0480         Pr(|T| > |t|) = 0.0960          Pr(T > t) = 0.9520

. ttest x8_1 if id==1, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    9.630652    3.276675    22.22349     3.03109    16.23021
       1 |       4     24.2425    11.47485     22.9497   -12.27559    60.76059
---------+--------------------------------------------------------------------
combined |      50     10.7996    3.168115    22.40195    4.433035    17.16617
---------+--------------------------------------------------------------------
    diff |           -14.61185    11.60882               -37.95294    8.729245
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.2587
Ho: diff = 0                                     degrees of freedom =       48

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.1071         Pr(|T| > |t|) = 0.2142          Pr(T > t) = 0.8929

. ttest x9_1 if id==1, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
```

```
---------+--------------------------------------------------------------------
       0 |      46    4.922826    3.597244     24.3977   -2.322396    12.16805
       1 |       4        -.31    .2052234    .4104469   -.9631126    .3431126
---------+--------------------------------------------------------------------
combined |      50      4.5042    3.312772    23.42483   -2.153064    11.16146
---------+--------------------------------------------------------------------
    diff |           5.232826    12.31444               -19.52701    29.99267
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.4249
Ho: diff = 0                                     degrees of freedom =       48

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.6636         Pr(|T| > |t|) = 0.6728          Pr(T > t) = 0.3364

. ttest x10_1 if id==1, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46     6.37413    3.276646     22.2233   -.2253741    12.97364
       1 |       4       20.99    11.47506    22.95012   -15.52876    57.50876
---------+--------------------------------------------------------------------
combined |      50      7.5434    3.168121      22.402    1.176822    13.90998
---------+--------------------------------------------------------------------
    diff |          -14.61587    11.60874               -37.9568     8.72506
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.2590
Ho: diff = 0                                     degrees of freedom =       48

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.1071         Pr(|T| > |t|) = 0.2141          Pr(T > t) = 0.8929
```

ID2

```
. ttest x1_1 if id==2, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      58    .0643103     .004719    .0359391    .0548606    .0737601
       1 |       9    .0722222    .0123353     .037006    .0437769    .1006676
---------+--------------------------------------------------------------------
combined |      67    .0653731     .004386    .0359009    .0566162      .07413
---------+--------------------------------------------------------------------
    diff |          -.0079119    .0129233               -.0337215    .0178978
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -0.6122
Ho: diff = 0                                     degrees of freedom =       65

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.2713         Pr(|T| > |t|) = 0.5425          Pr(T > t) = 0.7287

. ttest x2_1 if id==2, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      58    127.7041    28.63489    218.0768    70.36377    185.0445
       1 |       9    38.69778    19.43851    58.31553   -6.127507    83.52306
---------+--------------------------------------------------------------------
combined |      67    115.7481    25.16209    205.9606    65.51033    165.9858
---------+--------------------------------------------------------------------
    diff |           89.00636    73.52936               -57.84191    235.8546
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   1.2105
Ho: diff = 0                                     degrees of freedom =       65

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.8848         Pr(|T| > |t|) = 0.2305          Pr(T > t) = 0.1152

. ttest x3_1 if id==2, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      58   -.0115517    .0229861    .1750569   -.0575806    .0344771
       1 |       9    .2777778    .0924479    .2773436    .0645927    .4909629
---------+--------------------------------------------------------------------
combined |      67    .0273134    .0261087    .2137088   -.0248142    .0794411
```

```
---------+--------------------------------------------------------------------
    diff |           -.2893295    .0682961               -.4257263   -.1529327
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -4.2364
Ho: diff = 0                                     degrees of freedom =       65

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0001          Pr(T > t) = 1.0000

. ttest x4_1 if id==2, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      58   -.0084483    .0226293    .1723399   -.0537628    .0368662
       1 |       9    .2744444    .0951039    .2853117    .0551344    .4937545
---------+--------------------------------------------------------------------
combined |      67    .0295522     .025906    .2120494   -.0221707    .0812752
---------+--------------------------------------------------------------------
    diff |           -.2828927    .0680364               -.4187708   -.1470147
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -4.1580
Ho: diff = 0                                     degrees of freedom =       65

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0001          Pr(T > t) = 1.0000

. ttest x5_1 if id==2, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      58    38.15845     6.36436    48.46952    25.41404    50.90286
       1 |       9    117.8411    52.84229    158.5269   -4.013425    239.6957
---------+--------------------------------------------------------------------
combined |      67    48.86209     9.32386    76.31909     30.2464    67.47778
---------+--------------------------------------------------------------------
    diff |           -79.68266    25.71812               -131.0453   -28.32002
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -3.0983
Ho: diff = 0                                     degrees of freedom =       65

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0014         Pr(|T| > |t|) = 0.0029          Pr(T > t) = 0.9986

. ttest x6_1 if id==2, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      58     .402931    .2568014    1.955741   -.1113048    .9171669
       1 |       9    2.693333    2.254018    6.762054   -2.504441    7.891108
---------+--------------------------------------------------------------------
combined |      67     .710597    .3758587    3.076536   -.0398291    1.461023
---------+--------------------------------------------------------------------
    diff |           -2.290402    1.073708               -4.434746   -.1460588
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.1332
Ho: diff = 0                                     degrees of freedom =       65

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0183         Pr(|T| > |t|) = 0.0367          Pr(T > t) = 0.9817
. ttest x7_1 if id==2, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      58    19.00931    6.364298    48.46905    6.265024     31.7536
       1 |       9    98.69111    52.84229    158.5269   -23.16342    220.5456
---------+--------------------------------------------------------------------
combined |      67    29.71284    9.323816    76.31872    11.09724    48.32843
---------+--------------------------------------------------------------------
    diff |           -79.6818    25.71802               -131.0442   -28.31936
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -3.0983
Ho: diff = 0                                     degrees of freedom =       65

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0014         Pr(|T| > |t|) = 0.0029          Pr(T > t) = 0.9986
```

```
. ttest x8_1 if id==2, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      58    18.70224    3.187995    24.27905    12.31839    25.08609
       1 |       9    51.39667    26.14472    78.43417   -8.893173    111.6865
---------+--------------------------------------------------------------------
combined |      67    23.09403     4.53997    37.16126    14.02969    32.15837
---------+--------------------------------------------------------------------
    diff |           -32.69443    12.78794               -58.23371   -7.155142
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.5567
Ho: diff = 0                                     degrees of freedom =       65

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0065         Pr(|T| > |t|) = 0.0129          Pr(T > t) = 0.9935

. ttest x9_1 if id==2, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      58    .4817241    .2669786    2.033248   -.0528913     1.01634
       1 |       9    7.288889    6.780381    20.34114   -8.346697    22.92447
---------+--------------------------------------------------------------------
combined |      67    1.396119    .9399372    7.693718   -.4805259    3.272765
---------+--------------------------------------------------------------------
    diff |           -6.807165    2.646055               -12.0917   -1.522627
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.5726
Ho: diff = 0                                     degrees of freedom =       65

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0062         Pr(|T| > |t|) = 0.0124          Pr(T > t) = 0.9938

. ttest x10_1 if id==2, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      58    14.53086    3.187948    24.27869    8.147106    20.91462
       1 |       9    47.22556    26.14491    78.43473   -13.06472    107.5158
---------+--------------------------------------------------------------------
combined |      67    18.92269    4.539967    37.16123    9.858351    27.98702
---------+--------------------------------------------------------------------
    diff |           -32.69469    12.78792               -58.23393   -7.155454
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.5567
Ho: diff = 0                                     degrees of freedom =       65

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0065         Pr(|T| > |t|) = 0.0129          Pr(T > t) = 0.9935
```

ID3

```
. ttest x1_1 if id==3, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    .0319149     .003036    .0208137    .0258038     .038026
       1 |       2        .045        .025    .0353553   -.2726551    .3626551
---------+--------------------------------------------------------------------
combined |      49     .032449    .0030239    .0211671    .0263691    .0385289
---------+--------------------------------------------------------------------
    diff |           -.0130851    .0153258               -.0439167    .0177465
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -0.8538
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.1988         Pr(|T| > |t|) = 0.3975          Pr(T > t) = 0.8012

. ttest x2_1 if id==3, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
```

```
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    761.8804    299.5481    2053.598    158.9214    1364.839
       1 |       2           0           0           0           0           0
---------+--------------------------------------------------------------------
combined |      49    730.7833    288.0173    2016.121    151.6857    1309.881
---------+--------------------------------------------------------------------
    diff |           761.8804    1466.829               -2188.999     3712.76
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.5194
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.6970         Pr(|T| > |t|) = 0.6059          Pr(T > t) = 0.3030

. ttest x3_1 if id==3, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    .0040426    .0138134       .0947   -.0237624    .0318475
       1 |       2         .03         .01    .0141421    -.097062     .157062
---------+--------------------------------------------------------------------
combined |      49     .005102    .0132677    .0928736   -.0215744    .0317785
---------+--------------------------------------------------------------------
    diff |           -.0259574     .067658               -.1620678    .1101529
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -0.3837
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.3515         Pr(|T| > |t|) = 0.7030          Pr(T > t) = 0.6485

. ttest x4_1 if id==3, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    .0144681    .0137165    .0940353   -.0131417    .0420779
       1 |       2        .035        .035    .0494975   -.4097172    .4797172
---------+--------------------------------------------------------------------
combined |      49    .0153061    .0132033    .0924234    -.011241    .0418532
---------+--------------------------------------------------------------------
    diff |           -.0205319    .0673689               -.1560606    .1149968
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -0.3048
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.3809         Pr(|T| > |t|) = 0.7619          Pr(T > t) = 0.6191

. ttest x5_1 if id==3, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    10.43574    1.879728    12.88677    6.652048    14.21944
       1 |       2       88.38       69.14    97.77873    -790.127     966.887
---------+--------------------------------------------------------------------
combined |      49    13.61714    3.502581    24.51807    6.574731    20.65955
---------+--------------------------------------------------------------------
    diff |           -77.94426    13.81171               -105.7298   -50.15868
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -5.6433
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000

. ttest x6_1 if id==3, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    .4480851    .2141292    1.467996    .0170654    .8791048
       1 |       2       4.095       3.365    4.758829   -38.66138    46.85138
---------+--------------------------------------------------------------------
combined |      49    .5969388    .2502475    1.751733    .0937824    1.100095
---------+--------------------------------------------------------------------
```

```
    diff |           -3.646915    1.162165               -5.984889   -1.308941
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -3.1380
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0015         Pr(|T| > |t|) = 0.0029          Pr(T > t) = 0.9985

. ttest x7_1 if id==3, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47   -6.303191    1.879698    12.88656   -10.08683   -2.519555
       1 |       2       71.64       69.14    97.77872    -806.867     950.147
---------+--------------------------------------------------------------------
combined |      49   -3.121837    3.502547    24.51783   -10.16418    3.920506
---------+--------------------------------------------------------------------
    diff |           -77.94319    13.81161               -105.7286   -50.15781
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -5.6433
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000

. ttest x8_1 if id==3, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    8.151489    1.485139     10.1816    5.162059    11.14092
       1 |       2       68.39       65.14    92.12187   -759.2922    896.0722
---------+--------------------------------------------------------------------
combined |      49     10.6102    2.931776    20.52243    4.715474    16.50493
---------+--------------------------------------------------------------------
    diff |           -60.23851    12.12483               -84.63051   -35.84651
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -4.9682
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000

. ttest x9_1 if id==3, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    .5929787    .2398367    1.644237    .1102125    1.075745
       1 |       2       3.525       4.175    5.904341    -49.5234     56.5734
---------+--------------------------------------------------------------------
combined |      49     .712653    .2733288    1.913302    .1630886    1.262218
---------+--------------------------------------------------------------------
    diff |           -2.932021    1.328887               -5.605397    -.258645
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.2064
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0161         Pr(|T| > |t|) = 0.0323          Pr(T > t) = 0.9839

. ttest x10_1 if id==3, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47   -5.565319    1.485129    10.18153   -8.554728    -2.57591
       1 |       2       54.67       65.14    92.12187   -773.0122    882.3522
---------+--------------------------------------------------------------------
combined |      49   -3.106735    2.931717    20.52202   -9.001348    2.787878
---------+--------------------------------------------------------------------
    diff |           -60.23532     12.1248               -84.62726   -35.84338
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -4.9679
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

ID4

```
. ttest x1_1 if id==4, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48     .039375    .0042983    .0297798    .0307279    .0480221
       1 |       1         .09           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    .0404082           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -.050625           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x2_1 if id==4, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    24.71625    3.747531    25.96366    17.17719    32.25531
       1 |       1      113.12           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    26.52041           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -88.40375           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x3_1 if id==4, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    -.004375    .0146166    .1012666   -.0337797    .0250298
       1 |       1         .65           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    .0089796           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -.654375           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x4_1 if id==4, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    .0079167    .0132721    .0919518   -.0187834    .0346167
       1 |       1         .67           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    .0214286           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -.6620834           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x5_1 if id==4, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
```

```
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    26.40208    4.695117    32.52873    16.95673    35.84744
       1 |       1      144.19           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    28.80592           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -117.7879           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x6_1 if id==4, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    .4697917    .2159603    1.496217    .0353355    .9042478
       1 |       1       11.17           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    .6881633           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -10.70021           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x7_1 if id==4, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48   -21.53979    4.695205    32.52934   -30.98533   -12.09426
       1 |       1       96.24           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49   -19.13612           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -117.7798           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x8_1 if id==4, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    14.50958    2.668575    18.48843    9.141102    19.87806
       1 |       1       77.86           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    15.80245           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -63.35042           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x9_1 if id==4, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    .5220833    .2196283     1.52163    .0802481    .9639186
       1 |       1       10.53           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    .7263265           .           .           .           .
---------+--------------------------------------------------------------------
```

```
    diff |           -10.00792           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x10_1 if id==4, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48   -.9804166    2.668575    18.48843   -6.348898    4.388065
       1 |       1       62.37           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    .3124491           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -63.35042           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .
```

ID5

```
. ttest x1_1 if id==5, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    .0534783    .0058666    .0397893    .0416623    .0652942
       1 |       3    .0466667    .0066667     .011547    .0179823     .075351
---------+--------------------------------------------------------------------
combined |      49    .0530612     .005519    .0386331    .0419645    .0641579
---------+--------------------------------------------------------------------
    diff |            .0068116    .0232431               -.0399474    .0535706
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.2931
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.6146         Pr(|T| > |t|) = 0.7708          Pr(T > t) = 0.3854

. ttest x2_1 if id==5, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    12.02565    .5329273    3.614489    10.95228    13.09902
       1 |       3    11.10333    1.863333    3.227388    3.086057    19.12061
---------+--------------------------------------------------------------------
combined |      49    11.96918      .50974     3.56818    10.94428    12.99408
---------+--------------------------------------------------------------------
    diff |             .922319     2.14449               -3.391838    5.236476
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.4301
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.6655         Pr(|T| > |t|) = 0.6691          Pr(T > t) = 0.3345

. ttest x3_1 if id==5, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46   -.0365217      .01553    .1053295   -.0678007   -.0052427
       1 |       3         .17    .1274101    .2206808   -.3782014    .7182014
---------+--------------------------------------------------------------------
combined |      49   -.0238776     .017457    .1221989   -.0589772    .0112221
---------+--------------------------------------------------------------------
    diff |           -.2065217    .0671378               -.3415855   -.0714579
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -3.0761
Ho: diff = 0                                     degrees of freedom =       47
```

```
    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0017         Pr(|T| > |t|) = 0.0035          Pr(T > t) = 0.9983

. ttest x4_1 if id==5, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46   -.0678261    .0164857    .1118116     -.10103   -.0346221
       1 |       3    .1366667    .1301708    .2254625   -.4234132    .6967465
---------+--------------------------------------------------------------------
combined |      49   -.0553061    .0182344    .1276405   -.0919687   -.0186435
---------+--------------------------------------------------------------------
    diff |           -.2044928    .0708394               -.3470033   -.0619822
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.8867
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0029         Pr(|T| > |t|) = 0.0059          Pr(T > t) = 0.9971

. ttest x5_1 if id==5, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    129.5474    22.09583    149.8612     85.0441    174.0507
       1 |       3    338.7567    173.9538    301.2968   -409.7061    1087.219
---------+--------------------------------------------------------------------
combined |      49    142.3561    23.64934    165.5454    94.80593    189.9063
---------+--------------------------------------------------------------------
    diff |           -209.2093     94.9034               -400.1303   -18.28825
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.2044
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0162         Pr(|T| > |t|) = 0.0324          Pr(T > t) = 0.9838

. ttest x6_1 if id==5, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    .8791304    .5290993    3.588526   -.1865303    1.944791
       1 |       3         .45    .3731398    .6462971   -1.155491    2.055491
---------+--------------------------------------------------------------------
combined |      49    .8528571    .4969475    3.478632   -.1463227    1.852037
---------+--------------------------------------------------------------------
    diff |            .4291305    2.093846               -3.783144    4.641405
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.2049
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.5808         Pr(|T| > |t|) = 0.8385          Pr(T > t) = 0.4192

. ttest x7_1 if id==5, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    -27.9537    22.09573    149.8606   -72.45679    16.54939
       1 |       3    181.2567    173.9538    301.2968   -567.2061    929.7194
---------+--------------------------------------------------------------------
combined |      49    -15.1449    23.64927    165.5449   -62.69495    32.40515
---------+--------------------------------------------------------------------
    diff |           -209.2104    94.90303               -400.1306   -18.29008
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.2045
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0162         Pr(|T| > |t|) = 0.0324          Pr(T > t) = 0.9838

. ttest x8_1 if id==5, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
```

```
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    37.55826    6.586104    44.66913    24.29317    50.82335
       1 |       3    114.9167    60.61766    104.9929   -145.9001    375.7334
---------+--------------------------------------------------------------------
combined |      49    42.29449    7.396988    51.77892    27.42185    57.16713
---------+--------------------------------------------------------------------
    diff |           -77.35841    29.06713               -135.8339   -18.88289
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.6614
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0053         Pr(|T| > |t|) = 0.0106          Pr(T > t) = 0.9947

. ttest x9_1 if id==5, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    1.067609    .5359143    3.634748   -.0117782    2.146996
       1 |       3    .5333333    .3747147    .6490249   -1.078934    2.145601
---------+--------------------------------------------------------------------
combined |      49    1.034898     .503457    3.524199    .0226298    2.047166
---------+--------------------------------------------------------------------
    diff |            .5342754     2.12079               -3.732203    4.800754
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.2519
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.5989         Pr(|T| > |t|) = 0.8022          Pr(T > t) = 0.4011

. ttest x10_1 if id==5, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      46    15.31913    6.586129     44.6693    2.053987    28.58427
       1 |       3    92.67667    60.61766    104.9929   -168.1401    353.4934
---------+--------------------------------------------------------------------
combined |      49    20.05531    7.396997    51.77898    5.182647    34.92797
---------+--------------------------------------------------------------------
    diff |           -77.35754    29.06722               -135.8332   -18.88184
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.6613
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0053         Pr(|T| > |t|) = 0.0106          Pr(T > t) = 0.9947
```

ID6

```
. ttest x1_1 if id==6, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      45    .0375556    .0032591    .0218627    .0309873    .0441239
       1 |       4        .045    .0119024    .0238048    .0071213    .0828787
---------+--------------------------------------------------------------------
combined |      49    .0381633    .0031227    .0218588    .0318847    .0444418
---------+--------------------------------------------------------------------
    diff |           -.0074444    .0114742               -.0305276    .0156387
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -0.6488
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.2598         Pr(|T| > |t|) = 0.5196          Pr(T > t) = 0.7402

. ttest x2_1 if id==6, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      45    22.02889    7.151254    47.97207    7.616483    36.44129
       1 |       4      64.235    39.69525    79.39051   -62.09302     190.563
---------+--------------------------------------------------------------------
```

```
combined |      49    25.47429    7.339854    51.37898    10.71652    40.23205
---------+--------------------------------------------------------------------
    diff |           -42.20611    26.38182               -95.27949    10.86727
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.5998
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0582         Pr(|T| > |t|) = 0.1163          Pr(T > t) = 0.9418

. ttest x3_1 if id==6, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      45    .0348889    .0186694    .1252384   -.0027369    .0725147
       1 |       4         .08    .0570088    .1140175   -.1014274    .2614274
---------+--------------------------------------------------------------------
combined |      49    .0385714    .0176969    .1238783    .0029894    .0741534
---------+--------------------------------------------------------------------
    diff |           -.0451111    .0649851               -.1758442     .085622
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -0.6942
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.2455         Pr(|T| > |t|) = 0.4910          Pr(T > t) = 0.7545

. ttest x4_1 if id==6, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      45    .0671111    .0196808    .1320231     .027447    .1067752
       1 |       4        .095    .0405175     .081035   -.0339447    .2239447
---------+--------------------------------------------------------------------
combined |      49    .0693878    .0183211    .1282479    .0325506    .1062249
---------+--------------------------------------------------------------------
    diff |           -.0278889    .0674989               -.1636791    .1079013
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -0.4132
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.3407         Pr(|T| > |t|) = 0.6814          Pr(T > t) = 0.6593

. ttest x5_1 if id==6, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      45      23.498    3.378175    22.66149    16.68973    30.30626
       1 |       4     48.4575    25.64099    51.28198   -33.14358    130.0586
---------+--------------------------------------------------------------------
combined |      49    25.53551    3.732892    26.13024    18.03003    33.04099
---------+--------------------------------------------------------------------
    diff |           -24.9595    13.28798               -51.69147    1.772465
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.8784
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0333         Pr(|T| > |t|) = 0.0665          Pr(T > t) = 0.9667

. ttest x6_1 if id==6, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      45    .6635556    .2975912    1.996302    .0637999    1.263311
       1 |       4       .1025    .4952504    .9905007   -1.473608    1.678608
---------+--------------------------------------------------------------------
combined |      49    .6177551    .2762183    1.933528     .062381    1.173129
---------+--------------------------------------------------------------------
    diff |            .5610556    1.016202               -1.48328    2.605391
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.5521
Ho: diff = 0                                     degrees of freedom =       47
```

```
    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.7083         Pr(|T| > |t|) = 0.5835          Pr(T > t) = 0.2917

. ttest x7_1 if id==6, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      45       -6.54      3.3782    22.66165   -13.34831    .2683141
       1 |       4     18.4225    25.64229    51.28458   -63.18271    100.0277
---------+--------------------------------------------------------------------
combined |      49   -4.502245    3.732988    26.13091   -12.00792     3.00343
---------+--------------------------------------------------------------------
    diff |            -24.9625    13.28823               -51.69496    1.769962
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.8785
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0333         Pr(|T| > |t|) = 0.0665          Pr(T > t) = 0.9667

. ttest x8_1 if id==6, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      45    16.80978    2.572147    17.25449    11.62596     21.9936
       1 |       4     39.6725    21.68146    43.36291   -29.32757    108.6726
---------+--------------------------------------------------------------------
combined |      49    18.67612    2.963836    20.74685    12.71693    24.63531
---------+--------------------------------------------------------------------
    diff |           -22.86272    10.41848               -43.82201    -1.90344
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.1944
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0166         Pr(|T| > |t|) = 0.0332          Pr(T > t) = 0.9834

. ttest x9_1 if id==6, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      45    .8708889    .3786576    2.540113    .1077546    1.634023
       1 |       4         .29    .7259132    1.451826    -2.02018     2.60018
---------+--------------------------------------------------------------------
combined |      49    .8234694    .3520219    2.464153    .1156819    1.531257
---------+--------------------------------------------------------------------
    diff |            .5808889     1.29651               -2.027352     3.18913
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.4480
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.6719         Pr(|T| > |t|) = 0.6562          Pr(T > t) = 0.3281

. ttest x10_1 if id==6, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      45   -2.249333    2.572124    17.25433   -7.433109    2.934442
       1 |       4     20.6125    21.68146    43.36291   -48.38757    89.61257
---------+--------------------------------------------------------------------
combined |      49   -.3830613    2.963808    20.74666   -6.342197    5.576074
---------+--------------------------------------------------------------------
    diff |           -22.86183    10.41842               -43.82098   -1.902681
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.1944
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0166         Pr(|T| > |t|) = 0.0332          Pr(T > t) = 0.9834
```

ID7

```
. ttest x1_1 if id==7, by(y)
```

```
Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    .0459574    .0059185    .0405752    .0340441    .0578708
       1 |       2        .115        .005    .0070711     .051469     .178531
---------+--------------------------------------------------------------------
combined |      49    .0487755     .006009    .0420631    .0366936    .0608574
---------+--------------------------------------------------------------------
    diff |           -.0690426    .0289913               -.1273656   -.0107195
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.3815
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0107         Pr(|T| > |t|) = 0.0213          Pr(T > t) = 0.9893

. ttest x2_1 if id==7, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47           0           0           0           0           0
       1 |       2           0           0           0           0           0
---------+--------------------------------------------------------------------
combined |      49           0           0           0           0           0
---------+--------------------------------------------------------------------
    diff |                    0           0                       0           0
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x3_1 if id==7, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47   -.0104255    .0143884     .098642   -.0393879    .0185369
       1 |       2        .255        .195    .2757716    -2.22271     2.73271
---------+--------------------------------------------------------------------
combined |      49    .0004082    .0167361     .117153   -.0332421    .0340584
---------+--------------------------------------------------------------------
    diff |           -.2654255    .0762083               -.4187368   -.1121142
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -3.4829
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0005         Pr(|T| > |t|) = 0.0011          Pr(T > t) = 0.9995

. ttest x4_1 if id==7, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    .0104255    .0144045    .0987522   -.0185692    .0394203
       1 |       2        .265        .175    .2474874   -1.958586    2.488586
---------+--------------------------------------------------------------------
combined |      49    .0208163    .0164204    .1149427   -.0121991    .0538317
---------+--------------------------------------------------------------------
    diff |           -.2545745    .0751974               -.4058521   -.1032968
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -3.3854
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0007         Pr(|T| > |t|) = 0.0014          Pr(T > t) = 0.9993

. ttest x5_1 if id==7, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    47.17575    8.934171    61.24959    29.19219     65.1593
       1 |       2      173.19      116.45    164.6852   -1306.448    1652.828
---------+--------------------------------------------------------------------
```

```
combined |      49    52.31918    9.892141    69.24498     32.4297    72.20867
---------+--------------------------------------------------------------------
    diff |           -126.0143    47.06133               -220.6894   -31.33908
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.6777
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0051         Pr(|T| > |t|) = 0.0102          Pr(T > t) = 0.9949

. ttest x6_1 if id==7, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    1.675319    1.062172    7.281883   -.4627217     3.81336
       1 |       2        -.49         .31    .4384062   -4.428924    3.448923
---------+--------------------------------------------------------------------
combined |      49    1.586939    1.020282    7.141974   -.4644757    3.638353
---------+--------------------------------------------------------------------
    diff |            2.165319    5.201456               -8.29866     12.6293
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.4163
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.6605         Pr(|T| > |t|) = 0.6791          Pr(T > t) = 0.3395

. ttest x7_1 if id==7, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    16.41106    8.934369    61.25095   -1.572889    34.39502
       1 |       2     142.425     116.445    164.6781   -1337.149    1621.999
---------+--------------------------------------------------------------------
combined |      49    21.55449    9.892252    69.24576    1.664784     41.4442
---------+--------------------------------------------------------------------
    diff |           -126.0139    47.06196               -220.6904   -31.33749
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.6776
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0051         Pr(|T| > |t|) = 0.0102          Pr(T > t) = 0.9949

. ttest x8_1 if id==7, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    26.96787    5.187495    35.56367    16.52599    37.40976
       1 |       2     104.355      69.305    98.01207   -776.2485    984.9585
---------+--------------------------------------------------------------------
combined |      49    30.12653    5.805619    40.63934    18.45355    41.79951
---------+--------------------------------------------------------------------
    diff |           -77.38713    27.41923               -132.5475   -22.22676
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.8224
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0035         Pr(|T| > |t|) = 0.0070          Pr(T > t) = 0.9965

. ttest x9_1 if id==7, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47        2.19    1.476617    10.12317   -.7822753    5.162275
       1 |       2       -.475        .325    .4596194   -4.604517    3.654517
---------+--------------------------------------------------------------------
combined |      49    2.081225    1.417795    9.924564    -.769443    4.931892
---------+--------------------------------------------------------------------
    diff |               2.665     7.23087               -11.88163    17.21163
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.3686
Ho: diff = 0                                     degrees of freedom =       47
```

```
    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.6429         Pr(|T| > |t|) = 0.7141          Pr(T > t) = 0.3571

. ttest x10_1 if id==7, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    12.58915    5.187519    35.56384    2.147215    23.03108
       1 |       2      89.975      69.305    98.01207   -790.6285    970.5785
---------+--------------------------------------------------------------------
combined |      49    15.74776    5.805625    40.63938    4.074764    27.42075
---------+--------------------------------------------------------------------
    diff |           -77.38585    27.41934               -132.5464   -22.22526
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.8223
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0035         Pr(|T| > |t|) = 0.0070          Pr(T > t) = 0.9965
```

ID8

```
. ttest x1_1 if id==8, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    .0583333    .0202409    .1402328     .017614    .0990527
       1 |       1         .06           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    .0583673           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -.0016667           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x2_1 if id==8, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    10.24396    .7133711     4.94238    8.808841    11.67908
       1 |       1       17.58           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    10.39367           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -7.336042           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x3_1 if id==8, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48   -.0483333    .0489376    .3390496   -.1467831    .0501164
       1 |       1         .54           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49   -.0363265           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -.5883334           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x4_1 if id==8, by(y)
```

```
Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48   -.0410417    .0481458    .3335639   -.1378985    .0558152
       1 |       1         .57           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49   -.0285714           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -.6110417           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x5_1 if id==8, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    11.70542    2.636797    18.26827    6.400864    17.00997
       1 |       1       73.06           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    12.95755           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -61.35458           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x6_1 if id==8, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    .7929167    .3463986     2.39992    .0960525    1.489781
       1 |       1        -.17           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    .7732653           .           .           .           .
---------+--------------------------------------------------------------------
    diff |            .9629167           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x7_1 if id==8, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    2.766875    2.636724    18.26776    -2.53753    8.071279
       1 |       1       64.12           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49     4.01898           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -61.35313           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x8_1 if id==8, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    3.595833    .7965108    5.518389     1.99346    5.198206
       1 |       1       26.81           .           .           .           .
---------+--------------------------------------------------------------------
```

```
combined |      49    4.069592           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -23.21417           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x9_1 if id==8, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    .9397917    .4558165    3.157989    .0228072    1.856776
       1 |       1        -.07           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    .9191837           .           .           .           .
---------+--------------------------------------------------------------------
    diff |            1.009792           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x10_1 if id==8, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    1.136667    .7964589    5.518029   -.4656019    2.738935
       1 |       1       24.35           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    1.610408           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -23.21333           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .
```

ID9

```
. ttest x1_1 if id==9, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    .0445833    .0043654    .0302443    .0358013    .0533654
       1 |       1         .04           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    .0444898           .           .           .           .
---------+--------------------------------------------------------------------
    diff |            .0045833           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x2_1 if id==9, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48           0           0           0           0           0
       1 |       1           0           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49           0           .           .           .           .
---------+--------------------------------------------------------------------
    diff |                   0           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
```

```
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x3_1 if id==9, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    .0077083    .0160375    .1111112    -.024555    .0399717
       1 |       1         .24           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49     .012449           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -.2322917           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x4_1 if id==9, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48     .024375    .0158279    .1096592   -.0074667    .0562167
       1 |       1         .26           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    .0291837           .           .           .           .
---------+--------------------------------------------------------------------
    diff |            -.235625           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x5_1 if id==9, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    28.94771    8.317723    57.62688    12.21461    45.68081
       1 |       1      204.44           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    32.52918           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -175.4923           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x6_1 if id==9, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    1.645208    .4561429     3.16025    .7275673    2.562849
       1 |       1         .99           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    1.631837           .           .           .           .
---------+--------------------------------------------------------------------
    diff |            .6552083           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x7_1 if id==9, by(y)
```

```
Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48   -12.16667     8.31787    57.62789   -28.90006    4.566729
       1 |       1      163.32           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49   -8.585306           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -175.4867           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x8_1 if id==9, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    19.72375    5.499172    38.09938    8.660842    30.78666
       1 |       1      122.39           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    21.81898           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -102.6662           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .
. ttest x9_1 if id==9, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    1.698958    .5636094      3.9048    .5651225    2.832794
       1 |       1         .78           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    1.680204           .           .           .           .
---------+--------------------------------------------------------------------
    diff |            .9189584           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x10_1 if id==9, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    7.545833    5.499353    38.10063   -3.517437     18.6091
       1 |       1      110.22           .           .           .           .
---------+--------------------------------------------------------------------
combined |      49    9.641225           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -102.6742           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       47

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .
```

ID10

```
. ttest x1_1 if id==10, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47     .147234    .0094075    .0644948    .1282977    .1661704
       1 |       4       .2025    .0278014    .0556028    .1140236    .2909764
```

```
---------+--------------------------------------------------------------------
combined |      51    .1515686    .0091153     .065096    .1332601    .1698772
---------+--------------------------------------------------------------------
    diff |           -.055266    .0333265               -.1222382    .0117062
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.6583
Ho: diff = 0                                     degrees of freedom =       49

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0518         Pr(|T| > |t|) = 0.1036          Pr(T > t) = 0.9482

. ttest x3_1 if id==10, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47   -.0102128     .037199    .2550234   -.0850904    .0646649
       1 |       4       .7175    .2659065    .5318129    -.128733    1.563733
---------+--------------------------------------------------------------------
combined |      51    .0468627    .0476601    .3403615   -.0488655     .142591
---------+--------------------------------------------------------------------
    diff |           -.7277128    .1458087               -1.020726   -.4346992
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -4.9909
Ho: diff = 0                                     degrees of freedom =       49

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000

. ttest x4_1 if id==10, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    .0034043    .0367622     .252029   -.0705942    .0774027
       1 |       4         .74    .2541981    .5083962   -.0689717    1.548972
---------+--------------------------------------------------------------------
combined |      51    .0611765    .0472678    .3375598   -.0337637    .1561167
---------+--------------------------------------------------------------------
    diff |           -.7365957    .1430698               -1.024105   -.4490863
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -5.1485
Ho: diff = 0                                     degrees of freedom =       49

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000

. ttest x8_1 if id==10, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    37.13787    12.66149    86.80284    11.65161    62.62414
       1 |       4      21.615     8.12626    16.25252   -4.246385    47.47639
---------+--------------------------------------------------------------------
combined |      51    35.92039    11.68673    83.45997     12.4469    59.39389
---------+--------------------------------------------------------------------
    diff |           15.52287    43.85477               -72.60659    103.6523
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.3540
Ho: diff = 0                                     degrees of freedom =       49

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.6376         Pr(|T| > |t|) = 0.7249          Pr(T > t) = 0.3624

. ttest x9_1 if id==10, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    18.83915    10.13679    69.49432   -1.565147    39.24345
       1 |       4        -.37    .3897863    .7795725   -1.610474    .8704739
---------+--------------------------------------------------------------------
combined |      51    17.33255    9.362361    66.86063   -1.472307     36.1374
---------+--------------------------------------------------------------------
    diff |           19.20915    35.07019               -51.26704    89.68533
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.5477
Ho: diff = 0                                     degrees of freedom =       49
```

```
    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.7068         Pr(|T| > |t|) = 0.5864          Pr(T > t) = 0.2932

. ttest x10_1 if id==10, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      47    33.30574    12.66159    86.80348    7.819289     58.7922
       1 |       4       17.78    8.123855    16.24771   -8.073732    43.63373
---------+--------------------------------------------------------------------
combined |      51    32.08804    11.68682    83.46057    8.614375     55.5617
---------+--------------------------------------------------------------------
    diff |            15.52574    43.85507               -72.60431    103.6558
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.3540
Ho: diff = 0                                     degrees of freedom =       49

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.6376         Pr(|T| > |t|) = 0.7248          Pr(T > t) = 0.3624
```

ID11

```
. ttest x1_1 if id==11, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48         .09    .0071086    .0492497    .0756994    .1043006
       1 |       8      .12625    .0316192    .0894327    .0514824    .2010176
---------+--------------------------------------------------------------------
combined |      56    .0951786    .0076234    .0570483    .0799009    .1104562
---------+--------------------------------------------------------------------
    diff |             -.03625    .0214259               -.0792064    .0067064
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.6919
Ho: diff = 0                                     degrees of freedom =       54

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0482         Pr(|T| > |t|) = 0.0964          Pr(T > t) = 0.9518

. ttest x3_1 if id==11, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48   -.0195833     .026906    .1864102   -.0737112    .0345445
       1 |       8         .42    .1691576    .4784499    .0200059    .8199941
---------+--------------------------------------------------------------------
combined |      56    .0432143    .0384801     .287959   -.0339016    .1203302
---------+--------------------------------------------------------------------
    diff |           -.4395833    .0934778               -.626995   -.2521717
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -4.7025
Ho: diff = 0                                     degrees of freedom =       54

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000

. ttest x4_1 if id==11, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48   -.0208333    .0263043    .1822418   -.0737508    .0320842
       1 |       8      .42875    .1672726    .4731184    .0332131    .8242869
---------+--------------------------------------------------------------------
combined |      56    .0433929    .0382823    .2864788   -.0333267    .1201124
---------+--------------------------------------------------------------------
    diff |           -.4495833    .0919083               -.6338484   -.2653183
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -4.8917
Ho: diff = 0                                     degrees of freedom =       54

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000

. ttest x8_1 if id==11, by(y)
```

```
Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48       .6475    .1792452    1.241847    .2869051    1.008095
       1 |       8      .92875    .4667227    1.320091   -.1748739    2.032374
---------+--------------------------------------------------------------------
combined |      56    .6876786     .166343    1.244797    .3543197    1.021037
---------+--------------------------------------------------------------------
    diff |            -.28125     .478217               -1.240017    .6775174
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -0.5881
Ho: diff = 0                                     degrees of freedom =       54

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.2795         Pr(|T| > |t|) = 0.5589          Pr(T > t) = 0.7205

. ttest x9_1 if id==11, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48      1.7125    1.022583    7.084666   -.3446725    3.769673
       1 |       8     5.52875    5.312416    15.02578   -7.033117    18.09062
---------+--------------------------------------------------------------------
combined |      56    2.257679    1.145195    8.569853   -.0373432      4.5527
---------+--------------------------------------------------------------------
    diff |           -3.81625    3.261746               -10.35566    2.723157
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.1700
Ho: diff = 0                                     degrees of freedom =       54

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.1236         Pr(|T| > |t|) = 0.2471          Pr(T > t) = 0.8764

. ttest x10_1 if id==11, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48   -8.170625     .179238    1.241798   -8.531205   -7.810045
       1 |       8     -7.8875    .4673166    1.321771   -8.992528   -6.782472
---------+--------------------------------------------------------------------
combined |      56   -8.130179    .1663747    1.245035   -8.463601   -7.796756
---------+--------------------------------------------------------------------
    diff |           -.2831251    .4782883               -1.242035    .6757852
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -0.5920
Ho: diff = 0                                     degrees of freedom =       54

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.2782         Pr(|T| > |t|) = 0.5564          Pr(T > t) = 0.7218
```

ID12

```
. ttest x1_1 if id==12, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      36    .0744444    .0096646    .0579874    .0548243    .0940646
       1 |       2         .09         .03    .0424264   -.2911861    .4711861
---------+--------------------------------------------------------------------
combined |      38    .0752632    .0092364     .056937    .0565484    .0939779
---------+--------------------------------------------------------------------
    diff |           -.0155556    .0418541               -.1004396    .0693285
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -0.3717
Ho: diff = 0                                     degrees of freedom =       36

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.3562         Pr(|T| > |t|) = 0.7123          Pr(T > t) = 0.6438

. ttest x3_1 if id==12, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
```

```
       0 |      36   -.0319444    .0555089    .3330536   -.1446336    .0807447
       1 |       2        .095        .065    .0919239   -.7309033    .9209033
---------+--------------------------------------------------------------------
combined |      38   -.0252632    .0528111    .3255493   -.1322686    .0817422
---------+--------------------------------------------------------------------
    diff |           -.1269444    .2388331               -.6113204    .3574316
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -0.5315
Ho: diff = 0                                     degrees of freedom =       36

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.2992         Pr(|T| > |t|) = 0.5983          Pr(T > t) = 0.7008

. ttest x4_1 if id==12, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      36   -.0158333    .0550056    .3300335   -.1275006     .095834
       1 |       2        .135        .035    .0494975   -.3097172    .5797172
---------+--------------------------------------------------------------------
combined |      38   -.0078947    .0523816     .322902     -.11403    .0982405
---------+--------------------------------------------------------------------
    diff |           -.1508333    .2364863               -.6304497     .328783
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -0.6378
Ho: diff = 0                                     degrees of freedom =       36

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.2638         Pr(|T| > |t|) = 0.5276          Pr(T > t) = 0.7362

. ttest x8_1 if id==12, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      36    50.41667    14.47904    86.87424    21.02265    79.81068
       1 |       2     138.395     129.195    182.7093   -1503.183    1779.973
---------+--------------------------------------------------------------------
combined |      38    55.04711    14.90124     91.8574    24.85433    85.23988
---------+--------------------------------------------------------------------
    diff |           -87.97833    66.04522               -221.9242    45.96758
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.3321
Ho: diff = 0                                     degrees of freedom =       36

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0956         Pr(|T| > |t|) = 0.1912          Pr(T > t) = 0.9044

. ttest x9_1 if id==12, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      36    1.010556    .4870898    2.922539    .0217106      1.9994
       1 |       2        -.14         .64    .9050967   -8.271971    7.991971
---------+--------------------------------------------------------------------
combined |      38         .95     .463666    2.858229    .0105234    1.889477
---------+--------------------------------------------------------------------
    diff |            1.150556    2.096346               -3.10103    5.402141
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   0.5488
Ho: diff = 0                                     degrees of freedom =       36

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.7067         Pr(|T| > |t|) = 0.5865          Pr(T > t) = 0.2933

. ttest x10_1 if id==12, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      36    30.80944    14.47918    86.87505    1.415155    60.20373
       1 |       2     118.785     129.195    182.7093   -1522.793    1760.363
---------+--------------------------------------------------------------------
combined |      38    35.43974    14.90134      91.858    5.246763    65.63271
---------+--------------------------------------------------------------------
    diff |           -87.97555    66.04577               -221.9226    45.97148
------------------------------------------------------------------------------
```

```
    diff = mean(0) - mean(1)                                      t =  -1.3320
Ho: diff = 0                                     degrees of freedom =       36

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0956         Pr(|T| > |t|) = 0.1912          Pr(T > t) = 0.9044
```

ID13

```
. ttest x1_1 if id==13, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      37    .0891892    .0234213     .142466    .0416887    .1366897
       1 |       1         .08           .           .           .           .
---------+--------------------------------------------------------------------
combined |      38    .0889474           .           .           .           .
---------+--------------------------------------------------------------------
    diff |            .0091892           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       36

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x3_1 if id==13, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      37   -.0540541    .0645619    .3927146   -.1849916    .0768835
       1 |       1         .54           .           .           .           .
---------+--------------------------------------------------------------------
combined |      38   -.0384211           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -.5940541           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       36

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x4_1 if id==13, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      37   -.0791892    .0614836    .3739903   -.2038838    .0455054
       1 |       1         .55           .           .           .           .
---------+--------------------------------------------------------------------
combined |      38   -.0626316           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -.6291892           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       36

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x8_1 if id==13, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      37    38.57541    11.15238    67.83729    15.95733    61.19348
       1 |       1      365.66           .           .           .           .
---------+--------------------------------------------------------------------
combined |      38    47.18289           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -327.0846           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       36

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .
```

```
. ttest x9_1 if id==13, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      37    .5459459    .2755046    1.675829   -.0128032    1.104695
       1 |       1        -.08           .           .           .           .
---------+--------------------------------------------------------------------
combined |      38    .5294737           .           .           .           .
---------+--------------------------------------------------------------------
    diff |            .6259459           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       36

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

. ttest x10_1 if id==13, by(y)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      37    15.43514     11.1524    67.83738   -7.182975    38.05325
       1 |       1      342.52           .           .           .           .
---------+--------------------------------------------------------------------
combined |      38    24.04263           .           .           .           .
---------+--------------------------------------------------------------------
    diff |           -327.0849           .                       .           .
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =        .
Ho: diff = 0                                     degrees of freedom =       36

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) =      .         Pr(|T| > |t|) =      .          Pr(T > t) =      .

.
```

Appendix E

Results from the Wilcoxon Rank Sum Test using STATA 9.0

ID1

```
. ranksum x1_1 if id==1, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       46        1101        1173
          1 |        4         174         102
------------+---------------------------------
   combined |       50        1275        1275

unadjusted variance      782.00
adjustment for ties      -10.06
                    ----------
adjusted variance        771.94

Ho: x1_1(y==0) = x1_1(y==1)
             z =  -2.591
    Prob > |z| =   0.0096


. ranksum x2_1 if id==1, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       46        1185        1173
          1 |        4          90         102
------------+---------------------------------
   combined |       50        1275        1275

unadjusted variance      782.00
adjustment for ties     -532.85
                    ----------
adjusted variance        249.15

Ho: x2_1(y==0) = x2_1(y==1)
             z =   0.760
    Prob > |z| =   0.4471

. ranksum x3_1 if id==1, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       46      1084.5        1173
          1 |        4       190.5         102
------------+---------------------------------
   combined |       50        1275        1275

unadjusted variance      782.00
adjustment for ties       -0.98
                    ----------
adjusted variance        781.02

Ho: x3_1(y==0) = x3_1(y==1)
             z =  -3.167
    Prob > |z| =   0.0015

. ranksum x4_1 if id==1, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       46        1085        1173
          1 |        4         190         102
------------+---------------------------------
   combined |       50        1275        1275

unadjusted variance      782.00
adjustment for ties       -2.44
                    ----------
adjusted variance        779.56
Ho: x4_1(y==0) = x4_1(y==1)
             z =  -3.152
    Prob > |z| =   0.0016

. ranksum x5_1 if id==1, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       46      1101.5        1173
          1 |        4       173.5         102
------------+---------------------------------
   combined |       50        1275        1275

unadjusted variance      782.00
adjustment for ties       -0.15
                    ----------
adjusted variance        781.85

Ho: x5_1(y==0) = x5_1(y==1)
             z =  -2.557
    Prob > |z| =   0.0106

. ranksum x6_1 if id==1, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       46        1212        1173
          1 |        4          63         102
------------+---------------------------------
   combined |       50        1275        1275

unadjusted variance      782.00
adjustment for ties       -0.56
                    ----------
adjusted variance        781.44

Ho: x6_1(y==0) = x6_1(y==1)
             z =   1.395
    Prob > |z| =   0.1630

. ranksum x7_1 if id==1, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       46      1101.5        1173
          1 |        4       173.5         102
------------+---------------------------------
   combined |       50        1275        1275

unadjusted variance      782.00
adjustment for ties       -0.11
                    ----------
adjusted variance        781.89

Ho: x7_1(y==0) = x7_1(y==1)
             z =  -2.557
    Prob > |z| =   0.0106

. ranksum x8_1 if id==1, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       46        1108        1173
          1 |        4         167         102
------------+---------------------------------
   combined |       50        1275        1275

unadjusted variance      782.00
adjustment for ties       -0.38
                    ----------
adjusted variance        781.62
```

```
Ho: x8_1(y==0) = x8_1(y==1)
             z =  -2.325
    Prob > |z| =   0.0201

. ranksum x9_1 if id==1, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       46      1208.5        1173
          1 |        4        66.5         102
------------+---------------------------------
    combined |       50        1275        1275

unadjusted variance      782.00
adjustment for ties       -0.23
                     ----------
adjusted variance        781.77

Ho: x9_1(y==0) = x9_1(y==1)
             z =   1.270
    Prob > |z| =   0.2042

. ranksum x10_1 if id==1, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       46        1108        1173
          1 |        4         167         102
------------+---------------------------------
    combined |       50        1275        1275

unadjusted variance      782.00
adjustment for ties       -0.19
                     ----------
adjusted variance        781.81

Ho: x10_1(y==0) = x10_1(y==1)
             z =  -2.325
    Prob > |z| =   0.0201
```

.ID2

```
. ranksum x1_1 if id==2, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       58        1945        1972
          1 |        9         333         306
------------+---------------------------------
    combined |       67        2278        2278

unadjusted variance     2958.00
adjustment for ties      -45.33
                     ----------
adjusted variance       2912.67

Ho: x1_1(y==0) = x1_1(y==1)
             z =  -0.500
    Prob > |z| =   0.6169

. ranksum x2_1 if id==2, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       58        2088        1972
          1 |        9         190         306
------------+---------------------------------
    combined |       67        2278        2278

unadjusted variance     2958.00
adjustment for ties      -26.91
                     ----------
adjusted variance       2931.09

Ho: x2_1(y==0) = x2_1(y==1)
             z =   2.143
    Prob > |z| =   0.0321

. ranksum x3_1 if id==2, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       58      1807.5        1972
          1 |        9       470.5         306
------------+---------------------------------
    combined |       67        2278        2278

unadjusted variance     2958.00
adjustment for ties       -2.72
                     ----------
adjusted variance       2955.28

Ho: x3_1(y==0) = x3_1(y==1)
             z =  -3.026
    Prob > |z| =   0.0025

. ranksum x4_1 if id==2, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       58      1809.5        1972
          1 |        9       468.5         306
------------+---------------------------------
    combined |       67        2278        2278

unadjusted variance     2958.00
adjustment for ties       -3.48
                     ----------
adjusted variance       2954.52

Ho: x4_1(y==0) = x4_1(y==1)
             z =  -2.990
    Prob > |z| =   0.0028

. ranksum x5_1 if id==2, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       58      1840.5        1972
          1 |        9       437.5         306
------------+---------------------------------
    combined |       67        2278        2278

unadjusted variance     2958.00
adjustment for ties       -0.06
                     ----------
adjusted variance       2957.94

Ho: x5_1(y==0) = x5_1(y==1)
             z =  -2.418
    Prob > |z| =   0.0156

. ranksum x6_1 if id==2, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       58        1933        1972
          1 |        9         345         306
------------+---------------------------------
    combined |       67        2278        2278

unadjusted variance     2958.00
adjustment for ties       -1.48
                     ----------
adjusted variance       2956.52

Ho: x6_1(y==0) = x6_1(y==1)
             z =  -0.717
    Prob > |z| =   0.4732

. ranksum x7_1 if id==2, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       58      1840.5        1972
```

```
          1 |        9       437.5         306
------------+---------------------------------
    combined |       67        2278        2278

unadjusted variance     2958.00
adjustment for ties       -0.06
                     ----------
adjusted variance       2957.94

Ho: x7_1(y==0) = x7_1(y==1)
             z =  -2.418
    Prob > |z| =   0.0156

. ranksum x8_1 if id==2, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       58        1876        1972
          1 |        9         402         306
------------+---------------------------------
    combined |       67        2278        2278

unadjusted variance     2958.00
adjustment for ties        0.00
                     ----------
adjusted variance       2958.00

Ho: x8_1(y==0) = x8_1(y==1)
             z =  -1.765
    Prob > |z| =   0.0775

. ranksum x9_1 if id==2, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       58      1936.5        1972
          1 |        9       341.5         306
------------+---------------------------------
    combined |       67        2278        2278

unadjusted variance     2958.00
adjustment for ties       -0.65
                     ----------
adjusted variance       2957.35

Ho: x9_1(y==0) = x9_1(y==1)
             z =  -0.653
    Prob > |z| =   0.5139

. ranksum x10_1 if id==2, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       58        1876        1972
          1 |        9         402         306
------------+---------------------------------
    combined |       67        2278        2278

unadjusted variance     2958.00
adjustment for ties        0.00
                     ----------
adjusted variance       2958.00

Ho: x10_1(y==0) = x10_1(y==1)
             z =  -1.765
    Prob > |z| =   0.0775
```

.ID3

```
. ranksum x1_1 if id==3, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47        1160        1175
          1 |        2          65          50
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties      -13.07
                     ----------
adjusted variance        378.60

Ho: x1_1(y==0) = x1_1(y==1)
             z =  -0.771
    Prob > |z| =   0.4408

. ranksum x2_1 if id==3, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47        1196        1175
          1 |        2          29          50
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties      -73.08
                     ----------
adjusted variance        318.59

Ho: x2_1(y==0) = x2_1(y==1)
             z =   1.177
    Prob > |z| =   0.2394

. ranksum x3_1 if id==3, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47        1151        1175
          1 |        2          74          50
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -2.16
                     ----------
adjusted variance        389.51

Ho: x3_1(y==0) = x3_1(y==1)
             z =  -1.216
    Prob > |z| =   0.2240

. ranksum x4_1 if id==3, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47      1158.5        1175
          1 |        2        66.5          50
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -1.58
                     ----------
adjusted variance        390.09

Ho: x4_1(y==0) = x4_1(y==1)
             z =  -0.835
    Prob > |z| =   0.4035

. ranksum x5_1 if id==3, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47        1135        1175
          1 |        2          90          50
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -0.02
                     ----------
adjusted variance        391.65

Ho: x5_1(y==0) = x5_1(y==1)
             z =  -2.021
```

```
    Prob > |z| =   0.0433

. ranksum x6_1 if id==3, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47        1139        1175
          1 |        2          86          50
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -0.12
                     ----------
adjusted variance        391.55

Ho: x6_1(y==0) = x6_1(y==1)
             z =  -1.819
    Prob > |z| =   0.0689

. ranksum x7_1 if id==3, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47        1135        1175
          1 |        2          90          50
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -0.00
                     ----------
adjusted variance        391.67

Ho: x7_1(y==0) = x7_1(y==1)
             z =  -2.021
    Prob > |z| =   0.0433

. ranksum x8_1 if id==3, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47        1154        1175
          1 |        2          71          50
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -0.02
                     ----------
adjusted variance        391.65

Ho: x8_1(y==0) = x8_1(y==1)
             z =  -1.061
    Prob > |z| =   0.2886

. ranksum x9_1 if id==3, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47        1171        1175
          1 |        2          54          50
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -0.08
                     ----------
adjusted variance        391.59

Ho: x9_1(y==0) = x9_1(y==1)
             z =  -0.202
    Prob > |z| =   0.8398

. ranksum x10_1 if id==3, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47        1154        1175
          1 |        2          71          50
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -0.02
                     ----------
adjusted variance        391.65

Ho: x10_1(y==0) = x10_1(y==1)
             z =  -1.061
    Prob > |z| =   0.2886
```

.ID4

```
. ranksum x1_1 if id==4, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1179        1200
          1 |        1          46          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -5.39
                     ----------
adjusted variance        194.61

Ho: x1_1(y==0) = x1_1(y==1)
             z =  -1.505
    Prob > |z| =   0.1322

. ranksum x2_1 if id==4, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1176        1200
          1 |        1          49          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -8.35
                     ----------
adjusted variance        191.65

Ho: x2_1(y==0) = x2_1(y==1)
             z =  -1.734
    Prob > |z| =   0.0830

. ranksum x3_1 if id==4, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1176        1200
          1 |        1          49          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.94
                     ----------
adjusted variance        199.06

Ho: x3_1(y==0) = x3_1(y==1)
             z =  -1.701
    Prob > |z| =   0.0889

. ranksum x4_1 if id==4, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1176        1200
          1 |        1          49          25
------------+---------------------------------
```

```
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.61
                       ----------
adjusted variance        199.39

Ho: x4_1(y==0) = x4_1(y==1)
             z =  -1.700
    Prob > |z| =   0.0892

. ranksum x5_1 if id==4, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       48        1176        1200
           1 |        1          49          25
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.00
                       ----------
adjusted variance        200.00

Ho: x5_1(y==0) = x5_1(y==1)
             z =  -1.697
    Prob > |z| =   0.0897


. ranksum x6_1 if id==4, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       48        1176        1200
           1 |        1          49          25
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.13
                       ----------
adjusted variance        199.87

Ho: x6_1(y==0) = x6_1(y==1)
             z =  -1.698
    Prob > |z| =   0.0896

. ranksum x7_1 if id==4, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       48        1176        1200
           1 |        1          49          25
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.00
                       ----------
adjusted variance        200.00

Ho: x7_1(y==0) = x7_1(y==1)
             z =  -1.697
    Prob > |z| =   0.0897

. ranksum x8_1 if id==4, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       48        1176        1200
           1 |        1          49          25
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.00
                       ----------
adjusted variance        200.00

Ho: x8_1(y==0) = x8_1(y==1)
             z =  -1.697
    Prob > |z| =   0.0897

. ranksum x9_1 if id==4, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       48        1176        1200
           1 |        1          49          25
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.08
                       ----------
adjusted variance        199.92

Ho: x9_1(y==0) = x9_1(y==1)
             z =  -1.697
    Prob > |z| =   0.0896

. ranksum x10_1 if id==4, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       48        1176        1200
           1 |        1          49          25
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.00
                       ----------
adjusted variance        200.00

Ho: x10_1(y==0) = x10_1(y==1)
             z =  -1.697
    Prob > |z| =   0.0897
```

ID5

```
. ranksum x1_1 if id==5, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       46      1141.5        1150
           1 |        3        83.5          75
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      575.00
adjustment for ties      -10.27
                       ----------
adjusted variance        564.73

Ho: x1_1(y==0) = x1_1(y==1)
             z =  -0.358
    Prob > |z| =   0.7206

. ranksum x2_1 if id==5, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       46        1162        1150
           1 |        3          63          75
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      575.00
adjustment for ties       -0.15
                       ----------
adjusted variance        574.85

Ho: x2_1(y==0) = x2_1(y==1)
             z =   0.500
    Prob > |z| =   0.6167
```

```
. ranksum x3_1 if id==5, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       46        1110        1150
           1 |        3         115          75
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      575.00
adjustment for ties       -1.85
                     ----------
adjusted variance        573.15

Ho: x3_1(y==0) = x3_1(y==1)
              z =  -1.671
    Prob > |z| =   0.0948

. ranksum x4_1 if id==5, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       46        1112        1150
           1 |        3         113          75
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      575.00
adjustment for ties       -1.88
                     ----------
adjusted variance        573.12

Ho: x4_1(y==0) = x4_1(y==1)
              z =  -1.587
    Prob > |z| =   0.1124

. ranksum x5_1 if id==5, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       46        1103        1150
           1 |        3         122          75
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      575.00
adjustment for ties       -0.00
                     ----------
adjusted variance        575.00

Ho: x5_1(y==0) = x5_1(y==1)
              z =  -1.960
    Prob > |z| =   0.0500

. ranksum x6_1 if id==5, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       46        1137        1150
           1 |        3          88          75
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      575.00
adjustment for ties       -0.15
                     ----------
adjusted variance        574.85

Ho: x6_1(y==0) = x6_1(y==1)
              z =  -0.542
    Prob > |z| =   0.5877

. ranksum x7_1 if id==5, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       46        1103        1150
           1 |        3         122          75
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      575.00
adjustment for ties       -0.00
                     ----------
adjusted variance        575.00

Ho: x7_1(y==0) = x7_1(y==1)
              z =  -1.960
    Prob > |z| =   0.0500

. ranksum x8_1 if id==5, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       46        1102        1150
           1 |        3         123          75
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      575.00
adjustment for ties       -0.00
                     ----------
adjusted variance        575.00

Ho: x8_1(y==0) = x8_1(y==1)
              z =  -2.002
    Prob > |z| =   0.0453

. ranksum x9_1 if id==5, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       46        1132        1150
           1 |        3          93          75
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      575.00
adjustment for ties       -0.15
                     ----------
adjusted variance        574.85

Ho: x9_1(y==0) = x9_1(y==1)
              z =  -0.751
    Prob > |z| =   0.4528

. ranksum x10_1 if id==5, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       46        1102        1150
           1 |        3         123          75
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      575.00
adjustment for ties       -0.00
                     ----------
adjusted variance        575.00

Ho: x10_1(y==0) = x10_1(y==1)
              z =  -2.002
    Prob > |z| =   0.0453
```

ID6

```
. ranksum x1_1 if id==6, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       45      1105.5        1125
           1 |        4       119.5         100
-------------+---------------------------------
    combined |       49        1225        1225
```

```
unadjusted variance      750.00
adjustment for ties      -24.95
                        ----------
adjusted variance        725.05

Ho: x1_1(y==0) = x1_1(y==1)
             z =  -0.724
    Prob > |z| =   0.4690

. ranksum x2_1 if id==6, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       45        1097        1125
           1 |        4         128         100
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      750.00
adjustment for ties     -297.40
                        ----------
adjusted variance        452.60

Ho: x2_1(y==0) = x2_1(y==1)
             z =  -1.316
    Prob > |z| =   0.1881

. ranksum x3_1 if id==6, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       45        1096        1125
           1 |        4         129         100
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      750.00
adjustment for ties       -2.95
                        ----------
adjusted variance        747.05

Ho: x3_1(y==0) = x3_1(y==1)
             z =  -1.061
    Prob > |z| =   0.2887

. ranksum x4_1 if id==6, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       45      1110.5        1125
           1 |        4       114.5         100
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      750.00
adjustment for ties       -2.64
                        ----------
adjusted variance        747.36

Ho: x4_1(y==0) = x4_1(y==1)
             z =  -0.530
    Prob > |z| =   0.5958

. ranksum x5_1 if id==6, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       45        1095        1125
           1 |        4         130         100
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      750.00
adjustment for ties       -0.08
                        ----------
adjusted variance        749.92

Ho: x5_1(y==0) = x5_1(y==1)
             z =  -1.096
    Prob > |z| =   0.2733

. ranksum x6_1 if id==6, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       45        1141        1125
           1 |        4          84         100
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      750.00
adjustment for ties       -0.15
                        ----------
adjusted variance        749.85

Ho: x6_1(y==0) = x6_1(y==1)
             z =   0.584
    Prob > |z| =   0.5590

. ranksum x7_1 if id==6, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       45        1095        1125
           1 |        4         130         100
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      750.00
adjustment for ties       -0.08
                        ----------
adjusted variance        749.92

Ho: x7_1(y==0) = x7_1(y==1)
             z =  -1.096
    Prob > |z| =   0.2733

. ranksum x8_1 if id==6, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       45        1087        1125
           1 |        4         138         100
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      750.00
adjustment for ties       -0.00
                        ----------
adjusted variance        750.00

Ho: x8_1(y==0) = x8_1(y==1)
             z =  -1.388
    Prob > |z| =   0.1653

. ranksum x9_1 if id==6, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       45      1138.5        1125
           1 |        4        86.5         100
-------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      750.00
adjustment for ties       -0.15
                        ----------
adjusted variance        749.85

Ho: x9_1(y==0) = x9_1(y==1)
             z =   0.493
    Prob > |z| =   0.6220

. ranksum x10_1 if id==6, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test
```

```
           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       45        1087        1125
           1 |        4         138         100
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      750.00
adjustment for ties       -0.00
                     ----------
adjusted variance        750.00

Ho: x10_1(y==0) = x10_1(y==1)
              z =  -1.388
    Prob > |z| =   0.1653

.
```

ID7

```
. ranksum x1_1 if id==7, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       47        1132        1175
           1 |        2          93          50
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties      -13.03
                     ----------
adjusted variance        378.64

Ho: x1_1(y==0) = x1_1(y==1)
              z =  -2.210
    Prob > |z| =   0.0271

. ranksum x2_1 if id==7, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       47        1175        1175
           1 |        2          50          50
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties     -391.67
                     ----------
adjusted variance          0.00

Ho: x2_1(y==0) = x2_1(y==1)
              z =       .
    Prob > |z| =       .

. ranksum x3_1 if id==7, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       47      1135.5        1175
           1 |        2        89.5          50
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -1.78
                     ----------
adjusted variance        389.89

Ho: x3_1(y==0) = x3_1(y==1)
              z =  -2.000
    Prob > |z| =   0.0455

. ranksum x4_1 if id==7, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       47        1134        1175
           1 |        2          91          50
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -1.50
                     ----------
adjusted variance        390.17

Ho: x4_1(y==0) = x4_1(y==1)
              z =  -2.076
    Prob > |z| =   0.0379

. ranksum x5_1 if id==7, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       47        1143        1175
           1 |        2          82          50
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -0.00
                     ----------
adjusted variance        391.67

Ho: x5_1(y==0) = x5_1(y==1)
              z =  -1.617
    Prob > |z| =   0.1059

. ranksum x6_1 if id==7, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       47      1199.5        1175
           1 |        2        25.5          50
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -0.12
                     ----------
adjusted variance        391.55

Ho: x6_1(y==0) = x6_1(y==1)
              z =   1.238
    Prob > |z| =   0.2157

. ranksum x7_1 if id==7, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       47        1143        1175
           1 |        2          82          50
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -0.00
                     ----------
adjusted variance        391.67

Ho: x7_1(y==0) = x7_1(y==1)
              z =  -1.617
    Prob > |z| =   0.1059

. ranksum x8_1 if id==7, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       47        1142        1175
           1 |        2          83          50
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -0.02
                     ----------
```

```
adjusted variance        391.65

Ho: x8_1(y==0) = x8_1(y==1)
             z =  -1.668
    Prob > |z| =   0.0954

. ranksum x9_1 if id==7, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47        1197        1175
          1 |        2          28          50
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -0.06
                     ----------
adjusted variance        391.61

Ho: x9_1(y==0) = x9_1(y==1)
             z =   1.112
    Prob > |z| =   0.2663

. ranksum x10_1 if id==7, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47        1142        1175
          1 |        2          83          50
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      391.67
adjustment for ties       -0.00
                     ----------
adjusted variance        391.67

Ho: x10_1(y==0) = x10_1(y==1)
             z =  -1.667
    Prob > |z| =   0.0954
```

ID8

```
. ranksum x1_1 if id==8, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48      1180.5        1200
          1 |        1        44.5          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties      -12.01
                     ----------
adjusted variance        187.99

Ho: x1_1(y==0) = x1_1(y==1)
             z =  -1.422
    Prob > |z| =   0.1550

. ranksum x2_1 if id==8, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1181        1200
          1 |        1          44          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.05
                     ----------
adjusted variance        199.95

Ho: x2_1(y==0) = x2_1(y==1)
             z =  -1.344
    Prob > |z| =   0.1791

. ranksum x3_1 if id==8, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1176        1200
          1 |        1          49          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -1.20
                     ----------
adjusted variance        198.80

Ho: x3_1(y==0) = x3_1(y==1)
             z =  -1.702
    Prob > |z| =   0.0887

. ranksum x4_1 if id==8, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1176        1200
          1 |        1          49          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.77
                     ----------
adjusted variance        199.23

Ho: x4_1(y==0) = x4_1(y==1)
             z =  -1.700
    Prob > |z| =   0.0891

. ranksum x5_1 if id==8, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1177        1200
          1 |        1          48          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.01
                     ----------
adjusted variance        199.99

Ho: x5_1(y==0) = x5_1(y==1)
             z =  -1.626
    Prob > |z| =   0.1039

. ranksum x6_1 if id==8, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1203        1200
          1 |        1          22          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.09
                     ----------
adjusted variance        199.91

Ho: x6_1(y==0) = x6_1(y==1)
             z =   0.212
    Prob > |z| =   0.8320

. ranksum x7_1 if id==8, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test
```

```
           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       48        1177        1200
           1 |        1          48          25
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.01
                     ----------
adjusted variance        199.99

Ho: x7_1(y==0) = x7_1(y==1)
              z =  -1.626
    Prob > |z| =   0.1039

. ranksum x8_1 if id==8, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       48        1177        1200
           1 |        1          48          25
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.07
                     ----------
adjusted variance        199.93

Ho: x8_1(y==0) = x8_1(y==1)
              z =  -1.627
    Prob > |z| =   0.1038

. ranksum x9_1 if id==8, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       48        1203        1200
           1 |        1          22          25
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.05
                     ----------
adjusted variance        199.95

Ho: x9_1(y==0) = x9_1(y==1)
              z =   0.212
    Prob > |z| =   0.8320

. ranksum x10_1 if id==8, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       48        1177        1200
           1 |        1          48          25
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.09
                     ----------
adjusted variance        199.91

Ho: x10_1(y==0) = x10_1(y==1)
              z =  -1.627
    Prob > |z| =   0.1038
```

ID9

```
. ranksum x1_1 if id==9, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       48      1194.5        1200
           1 |        1        30.5          25
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -5.83
                     ----------
adjusted variance        194.17

Ho: x1_1(y==0) = x1_1(y==1)
              z =  -0.395
    Prob > |z| =   0.6931

. ranksum x2_1 if id==9, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       48        1200        1200
           1 |        1          25          25
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties     -200.00
                     ----------
adjusted variance          0.00

Ho: x2_1(y==0) = x2_1(y==1)
              z =       .
    Prob > |z| =       .

. ranksum x3_1 if id==9, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       48        1178        1200
           1 |        1          47          25
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.55
                     ----------
adjusted variance        199.45

Ho: x3_1(y==0) = x3_1(y==1)
              z =  -1.558
    Prob > |z| =   0.1193

. ranksum x4_1 if id==9, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       48      1177.5        1200
           1 |        1        47.5          25
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.74
                     ----------
adjusted variance        199.26

Ho: x4_1(y==0) = x4_1(y==1)
              z =  -1.594
    Prob > |z| =   0.1109

. ranksum x5_1 if id==9, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       48        1178        1200
           1 |        1          47          25
-------------+--------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.00
                     ----------
adjusted variance        200.00
```

```
Ho: x5_1(y==0) = x5_1(y==1)
              z =  -1.556
    Prob > |z| =   0.1198

. ranksum x6_1 if id==9, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1195        1200
          1 |        1          30          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.06
                     ----------
adjusted variance        199.94

Ho: x6_1(y==0) = x6_1(y==1)
              z =  -0.354
    Prob > |z| =   0.7236

. ranksum x7_1 if id==9, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1178        1200
          1 |        1          47          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.00
                     ----------
adjusted variance        200.00

Ho: x7_1(y==0) = x7_1(y==1)
              z =  -1.556
    Prob > |z| =   0.1198

. ranksum x8_1 if id==9, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1178        1200
          1 |        1          47          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.05
                     ----------
adjusted variance        199.95

Ho: x8_1(y==0) = x8_1(y==1)
              z =  -1.556
    Prob > |z| =   0.1197

. ranksum x9_1 if id==9, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1196        1200
          1 |        1          29          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.02
                     ----------
adjusted variance        199.98

Ho: x9_1(y==0) = x9_1(y==1)
              z =  -0.283
    Prob > |z| =   0.7773

. ranksum x10_1 if id==9, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       48        1178        1200
          1 |        1          47          25
------------+---------------------------------
    combined |       49        1225        1225

unadjusted variance      200.00
adjustment for ties       -0.04
                     ----------
adjusted variance        199.96

Ho: x10_1(y==0) = x10_1(y==1)
              z =  -1.556
    Prob > |z| =   0.1198
```

ID10

```
. ranksum x1_1 if id==10, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47        1180        1222
          1 |        4         146         104
------------+---------------------------------
    combined |       51        1326        1326

unadjusted variance      814.67
adjustment for ties       -4.90
                     ----------
adjusted variance        809.76

Ho: x1_1(y==0) = x1_1(y==1)
              z =  -1.476
    Prob > |z| =   0.1400

. ranksum x3_1 if id==10, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47        1133        1222
          1 |        4         193         104
------------+---------------------------------
    combined |       51        1326        1326

unadjusted variance      814.67
adjustment for ties       -1.00
                     ----------
adjusted variance        813.67

Ho: x3_1(y==0) = x3_1(y==1)
              z =  -3.120
    Prob > |z| =   0.0018

. ranksum x4_1 if id==10, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       47      1133.5        1222
          1 |        4       192.5         104
------------+---------------------------------
    combined |       51        1326        1326

unadjusted variance      814.67
adjustment for ties       -1.00
                     ----------
adjusted variance        813.67

Ho: x4_1(y==0) = x4_1(y==1)
              z =  -3.103
    Prob > |z| =   0.0019

. ranksum x8_1 if id==10, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
```

```
-------------+---------------------------------
           0 |       47        1181        1222
           1 |        4         145         104
-------------+---------------------------------
    combined |       51        1326        1326

unadjusted variance      814.67
adjustment for ties       -0.81
                     ----------
adjusted variance        813.86

Ho: x8_1(y==0) = x8_1(y==1)
             z =  -1.437
    Prob > |z| =   0.1507

. ranksum x9_1 if id==10, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       47        1265        1222
           1 |        4          61         104
-------------+---------------------------------
    combined |       51        1326        1326

unadjusted variance      814.67
adjustment for ties       -0.07
                     ----------
adjusted variance        814.59

Ho: x9_1(y==0) = x9_1(y==1)
             z =   1.507
    Prob > |z| =   0.1319

. ranksum x10_1 if id==10, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       47        1181        1222
           1 |        4         145         104
-------------+---------------------------------
    combined |       51        1326        1326

unadjusted variance      814.67
adjustment for ties       -0.88
                     ----------
adjusted variance        813.78

Ho: x10_1(y==0) = x10_1(y==1)
             z =  -1.437
    Prob > |z| =   0.1506
```

ID11

```
. ranksum x1_1 if id==11, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       48      1337.5        1368
           1 |        8       258.5         228
-------------+---------------------------------
    combined |       56        1596        1596

unadjusted variance     1824.00
adjustment for ties      -13.15
                     ----------
adjusted variance        1810.85

Ho: x1_1(y==0) = x1_1(y==1)
             z =  -0.717
    Prob > |z| =   0.4735

. ranksum x3_1 if id==11, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       48      1220.5        1368
           1 |        8       375.5         228
-------------+---------------------------------
    combined |       56        1596        1596

unadjusted variance     1824.00
adjustment for ties       -2.18
                     ----------
adjusted variance        1821.82

Ho: x3_1(y==0) = x3_1(y==1)
             z =  -3.456
    Prob > |z| =   0.0005

. ranksum x4_1 if id==11, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       48        1210        1368
           1 |        8         386         228
-------------+---------------------------------
    combined |       56        1596        1596

unadjusted variance     1824.00
adjustment for ties       -2.99
                     ----------
adjusted variance        1821.01

Ho: x4_1(y==0) = x4_1(y==1)
             z =  -3.703
    Prob > |z| =   0.0002

. ranksum x8_1 if id==11, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       48        1309        1368
           1 |        8         287         228
-------------+---------------------------------
    combined |       56        1596        1596

unadjusted variance     1824.00
adjustment for ties       -1.31
                     ----------
adjusted variance        1822.69

Ho: x8_1(y==0) = x8_1(y==1)
             z =  -1.382
    Prob > |z| =   0.1670

. ranksum x9_1 if id==11, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       48      1354.5        1368
           1 |        8       241.5         228
-------------+---------------------------------
    combined |       56        1596        1596

unadjusted variance     1824.00
adjustment for ties       -0.31
                     ----------
adjusted variance        1823.69

Ho: x9_1(y==0) = x9_1(y==1)
             z =  -0.316
    Prob > |z| =   0.7519

. ranksum x10_1 if id==11, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+---------------------------------
           0 |       48      1307.5        1368
           1 |        8       288.5         228
-------------+---------------------------------
    combined |       56        1596        1596

unadjusted variance     1824.00
adjustment for ties       -1.62
                     ----------
adjusted variance        1822.38
```

```
Ho: x10_1(y==0) = x10_1(y==1)
            z =  -1.417
    Prob > |z| =   0.1564
```

ID12

```
. ranksum x1_1 if id==12, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       36       689.5         702
          1 |        2        51.5          39
------------+---------------------------------
    combined |       38         741         741

unadjusted variance      234.00
adjustment for ties       -3.38
                     ----------
adjusted variance        230.62

Ho: x1_1(y==0) = x1_1(y==1)
            z =  -0.823
    Prob > |z| =   0.4104

. ranksum x3_1 if id==12, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       36       680.5         702
          1 |        2        60.5          39
------------+---------------------------------
    combined |       38         741         741

unadjusted variance      234.00
adjustment for ties       -0.33
                     ----------
adjusted variance        233.67

Ho: x3_1(y==0) = x3_1(y==1)
            z =  -1.406
    Prob > |z| =   0.1596

. ranksum x4_1 if id==12, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       36       673.5         702
          1 |        2        67.5          39
------------+---------------------------------
    combined |       38         741         741

unadjusted variance      234.00
adjustment for ties       -0.51
                     ----------
adjusted variance        233.49

Ho: x4_1(y==0) = x4_1(y==1)
            z =  -1.865
    Prob > |z| =   0.0622

. ranksum x8_1 if id==12, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       36         690         702
          1 |        2          51          39
------------+---------------------------------
    combined |       38         741         741

unadjusted variance      234.00
adjustment for ties        0.00
                     ----------
adjusted variance        234.00

Ho: x8_1(y==0) = x8_1(y==1)
            z =  -0.784
    Prob > |z| =   0.4328

. ranksum x9_1 if id==12, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       36         711         702
          1 |        2          30          39
------------+---------------------------------
    combined |       38         741         741

unadjusted variance      234.00
adjustment for ties       -0.05
                     ----------
adjusted variance        233.95

Ho: x9_1(y==0) = x9_1(y==1)
            z =   0.588
    Prob > |z| =   0.5563

. ranksum x10_1 if id==12, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       36         690         702
          1 |        2          51          39
------------+---------------------------------
    combined |       38         741         741

unadjusted variance      234.00
adjustment for ties       -0.03
                     ----------
adjusted variance        233.97

Ho: x10_1(y==0) = x10_1(y==1)
            z =  -0.785
    Prob > |z| =   0.4327
```

ID13

```
. ranksum x1_1 if id==13, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       37         710       721.5
          1 |        1          31        19.5
------------+---------------------------------
    combined |       38         741         741

unadjusted variance      120.25
adjustment for ties       -3.43
                     ----------
adjusted variance        116.82

Ho: x1_1(y==0) = x1_1(y==1)
            z =  -1.064
    Prob > |z| =   0.2873

. ranksum x3_1 if id==13, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

          y |      obs    rank sum    expected
------------+---------------------------------
          0 |       37         703       721.5
          1 |        1          38        19.5
------------+---------------------------------
    combined |       38         741         741

unadjusted variance      120.25
adjustment for ties       -0.32
                     ----------
adjusted variance        119.93

Ho: x3_1(y==0) = x3_1(y==1)
            z =  -1.689
    Prob > |z| =   0.0912

. ranksum x4_1 if id==13, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test
```

```
           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       37         703       721.5
           1 |        1          38        19.5
-------------+--------------------------------
    combined |       38         741         741

unadjusted variance      120.25
adjustment for ties       -0.36
                     ----------
adjusted variance        119.89

Ho: x4_1(y==0) = x4_1(y==1)
             z =  -1.690
    Prob > |z| =   0.0911

. ranksum x8_1 if id==13, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       37         704       721.5
           1 |        1          37        19.5
-------------+--------------------------------
    combined |       38         741         741

unadjusted variance      120.25
adjustment for ties       -0.01
                     ----------
adjusted variance        120.24

Ho: x8_1(y==0) = x8_1(y==1)
             z =  -1.596
    Prob > |z| =   0.1105

. ranksum x9_1 if id==13, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       37         722       721.5
           1 |        1          19        19.5
-------------+--------------------------------
    combined |       38         741         741

unadjusted variance      120.25
adjustment for ties       -0.05
                     ----------
adjusted variance        120.20

Ho: x9_1(y==0) = x9_1(y==1)
             z =   0.046
    Prob > |z| =   0.9636

. ranksum x10_1 if id==13, by(y)

Two-sample Wilcoxon rank-sum (Mann-Whitney) test

           y |      obs    rank sum    expected
-------------+--------------------------------
           0 |       37         704       721.5
           1 |        1          37        19.5
-------------+--------------------------------
    combined |       38         741         741

unadjusted variance      120.25
adjustment for ties       -0.01
                     ----------
adjusted variance        120.24

Ho: x10_1(y==0) = x10_1(y==1)
             z =  -1.596
    Prob > |z| =   0.1105
```

Appendix F

Graphical illustration for stocks and warrants where time 0 represents the event week and -1 refers to the week prior to the event week.

- **Stock**

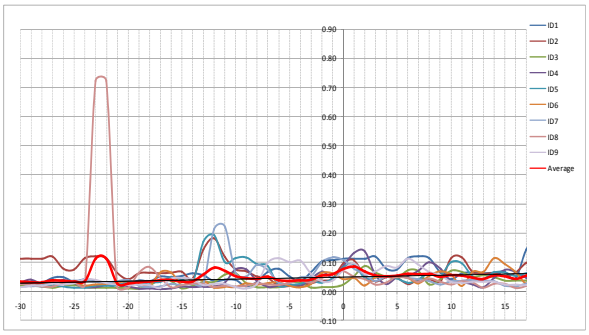

Figure 4 : trend of two-week standard deviation of stock's daily returns

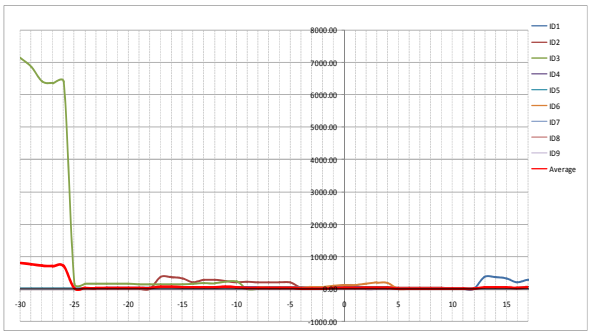

Figure 5 : trend of P/E ratio of stocks

The trend of P/E ratio suggests that it is not an appropriate indicator for abnormal trading as the minimum value for the variable is zero even though the firm generates operating losses. Therefore, this variable does not seem to correlate with the examined event.

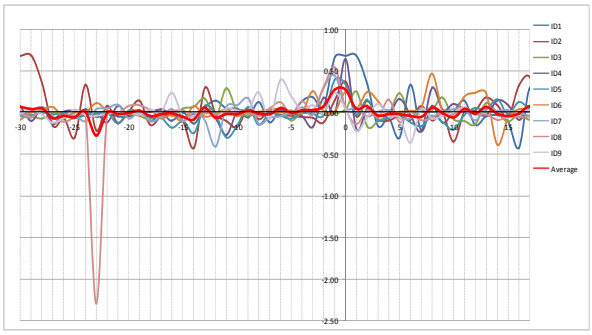

Figure 6 : trend of weekly returns

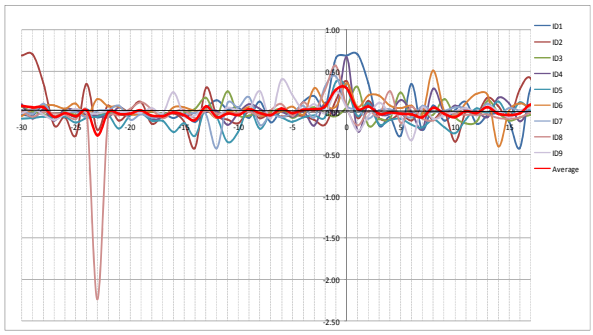

Figure 7 : trend of abnormal weekly returns

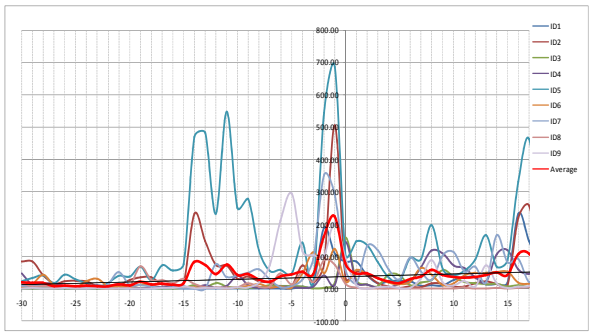

Figure 8 : trend of weekly turnover – SEC's formula

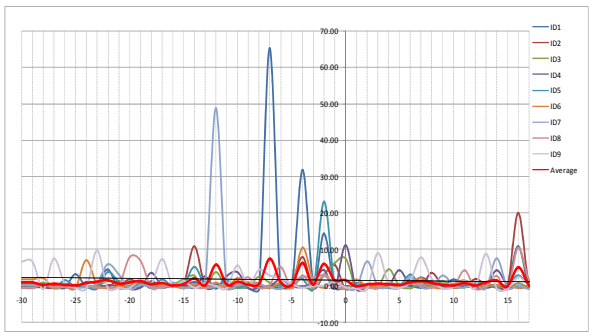

Figure 9 : trend of percentage change in weekly turnover – SEC's formula

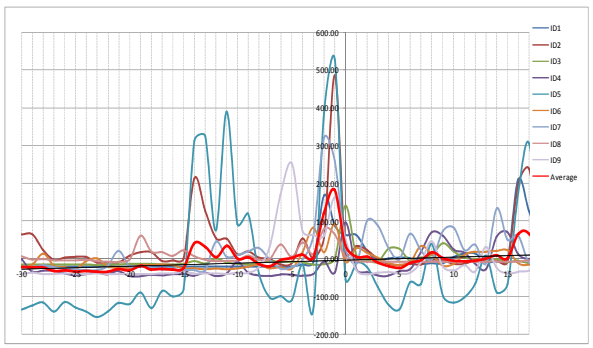

Figure 10 : trend of abnormal weekly turnover – SEC's formula

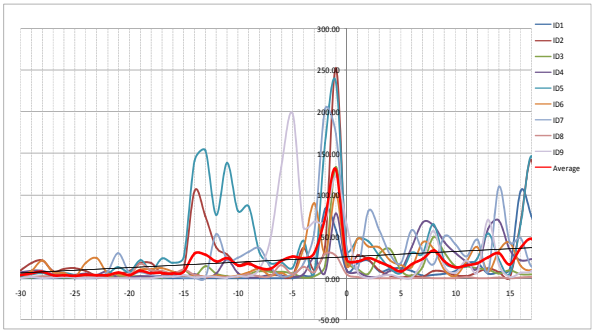

Figure 11 : trend of weekly volume turnover – non-SEC's formula

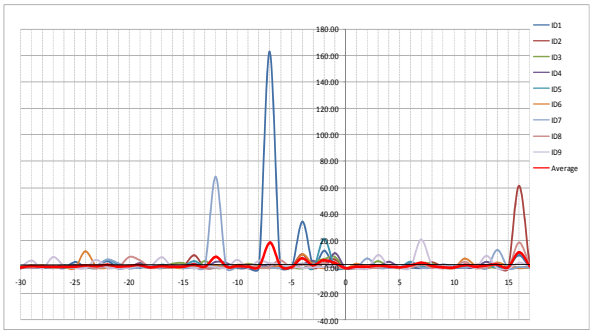

Figure 12 : trend of percentage change in weekly volume turnover – non-SEC's formula

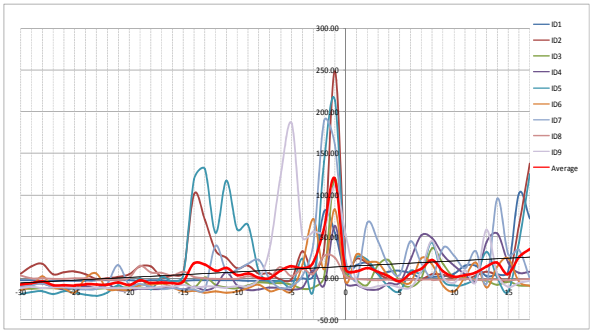

Figure 13 : trend of abnormal weekly volume turnover – non-SEC's formula

- **Warrants**

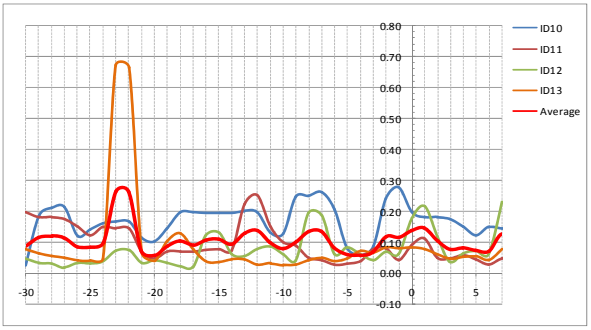

Figure 14 : trend of two-week standard deviation of warrant's daily returns

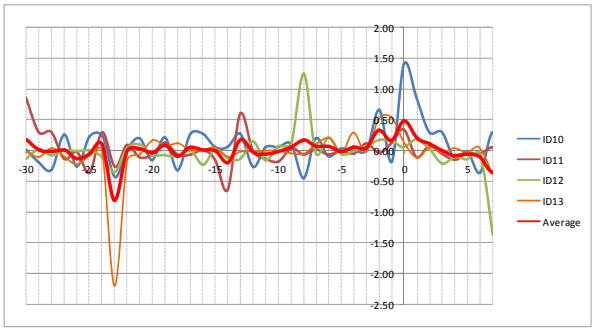

Figure 15 : trend of weekly returns

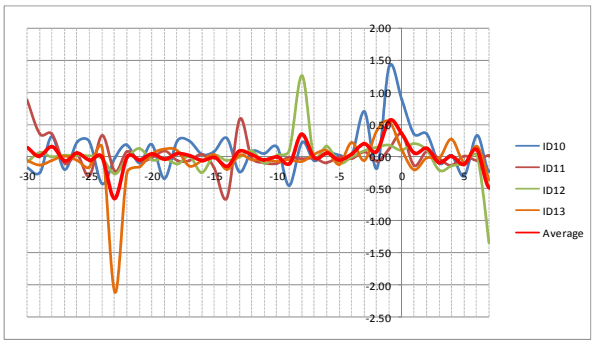

Figure 16 : trend of abnormal weekly returns

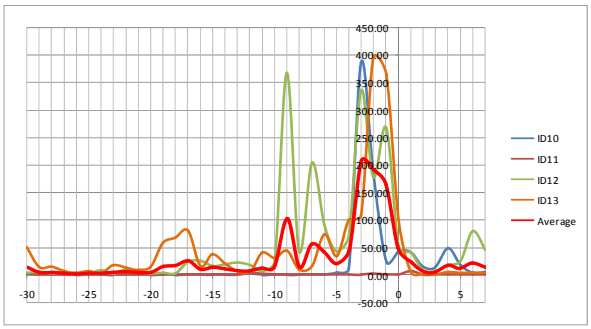

Figure 17 : trend of weekly volume turnover – non-SEC's formula

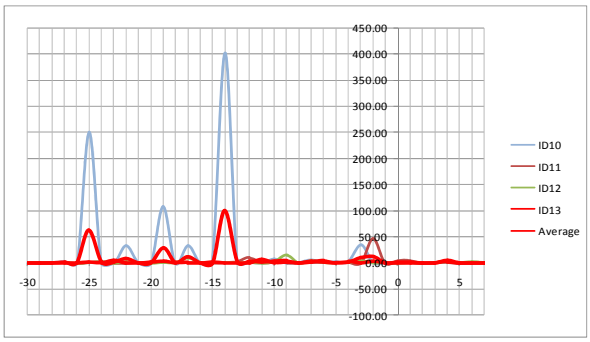

Figure 18 : trend of percentage change in weekly volume turnover – non-SEC's formula

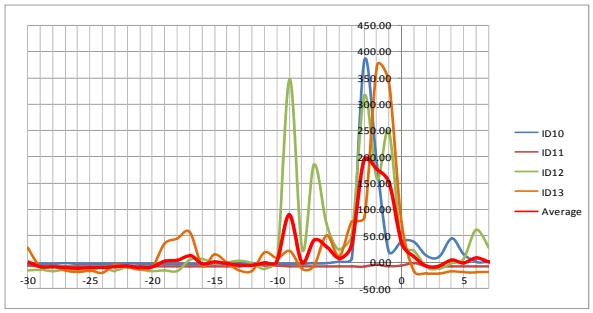

Figure 19 : trend of abnormal weekly volume turnover – non-SEC's formula