台灣上市公司持續買回庫藏股的訊號效果之研究

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摘要

　　除了台灣的上市公司以外，國外很少有公司在短期間持續多次買回庫藏股的案例，台灣的上市公司會在短期間持續多次買回庫藏股的理由，是因為政府主管當局對於買回庫藏股的法令規定。本研究採用事件研究法探討台灣上市公司持續買回庫藏股的訊號效果，衡量台灣上市公司在持續買回庫藏股的各次宣告與實際買回的行為中，是否會因為宣告買回次數的差異而有不同的訊號效果。同時，也進一步驗證持續買回庫藏股的行為是否隱涵公司股價被低估之效率市場假說。本研究的主要發現如下：1.當公司宣告與執行買回庫藏股時，股東會得到正的顯著異常報酬。2.隨著公司宣告與執行買回庫藏股的次數增加，買回庫藏股的訊號效果逐漸減弱，雖然統計上差異並不顯著。3.研究結果無法支持公司在宣告與執行買回庫藏股時存在所謂的小型股效應。

　　由於台灣對於公司買回庫藏股的法令有異於其他國家之相關規定，本研究不討論公司買回庫藏股對股價所產生的長期效果，聚焦在公司持續買回庫藏股時，每次實施後對股價的立即影響。研究的結果發現，公司持續多次買回庫藏股的行為，並無法連續地每次都傳遞正面的訊號至股市，持續買回庫藏股的行為反而會在股票市場中創造一些「雜訊」。因此，若上市公司的經營者嘗試利用持續買回庫藏股的宣告去操縱股價，結果很可能會適得其反。

關鍵詞：買回庫藏股、訊號效果、事件研究、異常報酬

A Study of Signaling Effects on Sequential Stock Repurchases in Taiwan

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ABSTRACT

Companies outside Taiwan rarely execute sequential stock repurchase programs on a short-term basis. Sequential stock repurchase programs arise from a special stock repurchase regulatory environment. This study adopts an event study methodology to investigate the signaling effects of sequential stock repurchase programs in Taiwan. Specifically, this study evaluates signaling effects among sequential stock repurchase programs and determines if the stock repurchase programs signal to the market that stock prices are undervalued. The major findings of this study are as follows: (1) stockholders earn a significantly positive abnormal return when stock repurchase programs are announced or executed; (2) the signaling effect on the announcement window gradually decreases if the frequency of stock repurchase programs increases, but this is not statistically significant; and (3) the empirical results of this study do not support the small-capital company effect of stock repurchase programs.

Instead of discussing the long-term effects of stock repurchases, this study focuses on the effect of sequential stock repurchase programs. The results of this study imply that sequential stock repurchase programs cannot continuously send positive signals to the stock market. On the other hand, the practice of sequential stock repurchases creates "noise" in the stock market. If the managers of listed firms attempt to use the announcement of sequential stock repurchase programs to manipulate stock prices, they may produce the opposite result.

Keywords: *stock repurchases, signaling effect, event study, abnormal return*

1. Introduction

Since the 1980s, investors have viewed stock repurchase as one of the most important financial instruments to substitute cash dividends in the U.S. (Grullon and Michaely, 2002). Unlike the U.S., the Securities and Exchange Commission (SEC) of Taiwan did not permit listed companies to repurchase their stocks before 2000 to prevent stock price manipulation. However, subsidiaries or affiliated companies can purchase the stock of their parent companies. As a result, many listed companies in Taiwan established non-listed subsidiary investment companies to repurchase their stock. This allowed parent company managers to control the company and use market operations to keep the stock price stable. Due to a continuous fall in stock prices in the first half of 2000, the Legislative Yuan was under intense pressure from investors and industrialists to set up a law of treasury stock (i.e., law of stock repurchase). The Legislative Yuan eventually passed an amendment of the Stock Exchange Law in June 2000 The amended law allows listed companies to repurchase common stocks under certain constraints. Following the modified law, the SEC of Taiwan initiated detailed regulations for stock repurchase programs and as a result, the law successfully came into effect as of August 2000. According to the new stock repurchase law, listed companies can repurchase common stocks under the following three conditions: (1) repurchasing common stocks for employee stock option plans or as incentives in compensation programs, (2) preventing extreme fluctuation in the stock price and protecting stockholders from capital loss, and (3) repurchasing common stocks as conversion objects of convertible securities.

According to the Stock Exchange Law, if the purpose of stock repurchase is to avoid extreme fluctuation in stock price and protect shareholders' equities, then companies must reissue or retire the treasury stock in 6 months. If the purpose of stock repurchase is to prepare for employee stock option or compensation programs, or to prepare for the conversion of convertible securities, the companies must reissue or retire the treasury stock in three years.

There are two ways in which companies can repurchase stocks: initiating a tender offer or repurchasing from the open market. When a tender offer is presented, the repurchasing company must set up the target stock price, volume, and record date in advance. To repurchase a large volume of common stocks in a short-term period, listed companies often set the offer price at least 20 percent above the

current market price[1]. A tender offer is a useful approach to take over another company, and many companies in the U.S. apply it to achieve their merger and acquisition goals. Previous research on stock repurchase also covers the issue of tender offer. Masulis (1980), Dann (1981), Vermaelen (1981, 1984), Lakonishok and Vermaelen (1990), and Davidson, et al. (1996) studied the reaction of common stock prices to tender offer programs. Their results confirm the signaling effects of stock repurchases. McNally (1999) found that stock prices declined continuously until stock repurchase programs ended. On the other hand, Netter and Mitchell (1989), Comment and Jarrell (1991), Ikenberry et al. (1995), Raad and Wu (1995), and Liu and Ziebart (1997) studied cases in which companies repurchased common stocks from the open market. They found that when the listed companies announced their intention to buy back stocks from the open market, the firms sent positive signaling effects to the market. However, the effect of buying back stocks directly from the open market was weaker than that of initiating a tender offer. A few studies suggest that the rationale for stock repurchase is related to excess capital, optimal leverage ratio, and management incentives, reach inconsistent conclusions. Dittmar (2000) recently summarized a company's motivations for engaging in stock repurchase as follows: excess capital, stock price undervaluation, optimal leverage ratio, management incentives, and takeover deterrence. Dittmar used the daily stock transaction data of the New York Stock Exchange (NYSE) from 1977 to 1996 to test the hypotheses of other studies. He found that historical data most significantly supported the undervaluation hypothesis, and other hypotheses were more or less supported by statistical evidence over different periods.

Firms listed in the NYSE, the American Stock Exchange (AMEX), or the National Association of Securities Dealer Automated Quotations (NASDAQ) can generally repurchase shares without making announcements, and firms that make announcements are under no obligation to implement their proposed plans. In the U.S. regulatory environment, research must rely on monthly and quarterly estimates of repurchases (Stephens and Weisbach, 1998) or voluntary questionnaires returned by the repurchasing firms (Cook et al., 2004). Ikenberry et al. (2000) studied stock repurchases in Canada in the 1990s. Canadian firms must report the number of shares they actually repurchase each month. This information offers data for

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[1] In a recent example, Accton Technology Corporation (SIC Code:2345) was taken over by tender offer on November 7, 2007. The given price of tender offer (NT$20) is 22.3% over the closing price (NT$16.35) on November 6, 2007.

accurately measuring program completion rates and examining factors that affect these managerial decisions. However, Ikenberry et al. (2000) found that the Canadian stock market discounted the information in repurchase announcements, particularly for value stocks. Managers will buy back stocks when prices are undervalued. Furthermore, completion rates are sensitive to mispricing. These results are similar to the evidence derived from U.S. firms.

Brockman and Chung (2001) showed that firms listed in the Stock Exchange of Hong Kong (SEHK) are required to disclose all repurchases by the start of the following business day. This makes it possible to measure the signaling effect of stock repurchases by SEHK-listed companies with greater accuracy. They found that managers possessed substantial timing abilities. These timing abilities were significantly related to overall market conditions and time-specific attributes.

In the Taiwanese regulatory environment, firms must disclose the number of shares they actually repurchased at the end of each stock repurchase program (two months). However, the firms that make announcements are under no obligation to implement their proposed plans. The stock price premium of stock repurchases from the open market is lower than that of a tender offer because the signaling strength of stock repurchases from the open market is weaker than that of a tender offer. The listed companies of the Taiwan Stock Exchange (TSE) and the R.O.C. Over-the-Counter Center Securities Exchange (OTC) never executed stock repurchases with a tender offer before 2007. The upper bound of stock repurchase volume for listed companies that are regulated by the SEC of Taiwan is ten percent of the outstanding stocks[2]. If the stock market undervalues stock prices, managers should repurchase stocks to increase current stockholder wealth. According to the Stock Exchange Law in Taiwan, if a company announces a stock repurchase program, this program must be executed within the following two months. Because firms that make announcements are under no obligation to implement their proposed plans, they can announce another stock repurchase program in the future regardless of their prior stock repurchase programs. This study examines the rationale for why companies initiate stock repurchase programs sequentially and, tests the signaling effects of sequential stock repurchase programs.

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[2] Canadian stock repurchase regulatory environment is similar to Taiwan environment. In Canada, these stock repurchase programs last one year and are limited to the maximum of either 10 percent of public float or five percent of shares outstanding (Ikenberry et al., 2000).

This study summarizes the signaling effects of stock repurchase programs based on three kinds of information signals. First, firms send positive signals to the stock market when they announce stock repurchase programs. Second, the signaling effect strength depends on announcement information and execution information. Third, positive signaling effects will persist but gradually decline as the frequency for stock repurchase programs increases.

Previous studies examine stock repurchases in Taiwan's stock market. Chen and Wu (2003) found that stock repurchase announcements have a positive effect on stock prices in Taiwan. They also found significantly different responses for different announced stock repurchase purposes. Tsai and Guo (2004) found significantly positive market reactions to stock repurchase announcements, indicating that the market treats repurchase announcements as signals conveying undervaluation-related information. Liu and Chen (2010) examined market reactions to the completion rate of stock repurchase programs. They found that market can predict the completion rate, which represents actual repurchases scaled by target shares, and react properly if the firms act different. Although stock repurchases have become one of the most important instruments for managers to send the signals for stock undervaluation, relatively few studies investigate the signaling effects of sequential stock repurchases.

When the stock repurchase programs were introduced in Taiwan, the SEC of Taiwan set. The objective of the amendment of the Stock Exchange Law is to increase the transparency of listed company's stock repurchases. Therefore, the Stock Exchange Law requires that each stock repurchase program must be executed in two months. This two-month rule requires listed companies to announce their execution results immediately and publicly after each stock repurchase program. On the other hand, the two-month rule causes listed companies to announce the next stock repurchase program immediately when their target shares of buyback is not completed in the current stock repurchase program. Thus, listed companies in Taiwan frequently execute sequential stock repurchases. However, the strength of signaling effect of stock repurchases decreases as the frequency increases. It is unreasonable for listed companies to execute multiple stock repurchase programs in a short run. Thus, the signaling effects of stock repurchases suggested in previous studies may not exist for sequential stock repurchases.

This study investigates the signaling effects of the announcement and

execution of stock repurchases. This study also examines whether the two-month rule for stock repurchases in Taiwan leads to any unique stock repurchases. The results of this study will help regulators review the law of stock repurchases and help investors avoid sequential stock repurchases.

The remainder of this paper is organized as follows. Section 2 describes the hypotheses and research methodology of this study. Section 3 presents the study results and analysis. Section 4 provides conclusions and suggestions for future research.

2. Hypothesis And Methodology

2.1 Hypotheses

Based on a literature review of the Stock Exchange Law of Taiwan, this study develops the following hypotheses to examine the signaling effects of stock repurchases. The first hypothesis relates to the signaling effects of announcement and execution. Managers can create true value for the firms using either a dividend or a stock repurchase approach (Ofer and Thakor, 1987). In this case a stock repurchase is usually considered an alternative for a cash dividend. Companies that repurchase stock send the market a signal of undervaluation of common stock. If the stock market is fully efficient, the stock prices will increase immediately once stock repurchases are announced and subsequently stabilize (Stewart, 1976; Vermaelen, 1981; Ofer and Thakor, 1987; Williams, 1988; Stephens and Weisbach, 1998). Therefore, there should be no abnormal return when firms actually execute stock repurchases. However, in Taiwan, the firms that make announcements are under no obligation to implement their proposed plans. The announcement of stock repurchases cannot deliver full information to the market. There should be two kinds of signaling effects of stock repurchases: the signaling effect of announcement and the signaling effect of execution. Because no precise stock repurchase data is available when stock repurchase programs are executed, the stock market will defer the signaling effects to the point when repurchasing companies disclose completion rates.

Hypothesis I: When companies *announce* stock repurchase plans or *execute* stock repurchases, they send positive signals to the stock market.

The second hypothesis is related to signaling persistence. Vermaelen (1981)

found that the signaling of stock repurchases is persistent and strengthened slowly. This could be because firms can make repurchase announcements with no obligation to actually implement their proposed plans (Brockman and Chung, 2001); in this case, the market needs time to confirm the firm's actual stock repurchases. Ikenberry et al. (1995, 2000) and Chan et al. (2004) found that repurchasing a company stock was undervalued and that the market's reaction to the announcement is often biased and incomplete. The market ignores implicit information contained in an announcement. McNally and Smith (2007) analyzed the profitability of trading after both program announcements and individual repurchase trade publications in Canadian firms using different trading strategies. They found that companies earned the highest abnormal returns on their own repurchase trade, which benefits non-tendering shareholders. Because the longest period for executing a stock repurchase program in Taiwan is two months, companies that repurchase stock must complete their programs by the expiration date regardless of how many stocks they have actually purchased. If these companies did not reach their target volume during the defined stock repurchase program, they might announce another stock repurchase program in the near future[3]. However, the strength of the signaling effect decreases as the times of stock repurchase programs for the same firm increases.

> **Hypothesis II:** Abnormal returns will be positive but decline gradually as the times of stock repurchase programs for the same firm increases.

The third hypothesis relates to the strength of signaling effects. Ikenberry et al. (2000) found that the completion rates of stock buyback in Canada were sensitive to mispricing, and managers would buy back stocks when prices were undervalued. If the announcement or execution of stock repurchase programs cannot increase current stockholder wealth, the stock repurchasing company should cancel the next stock repurchase program. The probability that a stock repurchasing company will announce a subsequent stock repurchase program depends on the level of abnormal returns in the last stock repurchase program. If the positive abnormal return of the last stock repurchase program was high, the firm will have greater motivation to announce another stock repurchase program. This study develops the following

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[3] The sample in this study includes six companies that exercised stock repurchases nine times from August, 2000 to January, 2002. These companies exercised each stock repurchase program for an average of two months, which means that they announced the next stock repurchase program immediately after the previous program ended.

hypothesis to test this assumption.

Hypothesis III: Companies that announce a subsequent stock repurchase program have higher positive abnormal returns than companies that do not announce another stock repurchase program.

Grullon and Michaely (2002) found that U.S. firms gradually began to substitute stock repurchases for dividends after 1983, when the regulatory constraints of stock repurchases were relaxed. If stock repurchase is a substitute for dividends of corporate cash disbursement, companies that repurchase stock should set a targeted repurchase volume before the announcement date. The value of the targeted repurchase volume should be equal to the dividend value the firm expects to pay out. A company will stop stock repurchasing upon reaching its targeted repurchase volume. Ikenberry et al. (2000) found that completion rates were sensitive to mispricing. Therefore, the lower the percentage of targeted volume that is achieved, the higher the probability that the stock repurchase companies will announce a subsequent stock repurchase program.

Hypothesis IV: Firms that announce subsequent stock repurchase programs have lower completion rates (the ratio of *the number of actual stock repurchases/the number of targeted stock repurchases*) than firms that do not announce subsequent stock repurchase programs.

2.2 Data

The sample in this study includes data collected from the stock repurchase databases of the TSE, the OTC, and the Taiwan Economic Journal (TEJ). Although listed companies can use a tender offer and repurchase from the open market to buy back stocks, no tender offers were issued in the Taiwanese stock market until 2007. The sample included all listed companies that repurchased stocks from the open market in the TSE and the OTC from August 9, 2000 to January 31, 2002[4]. Results show that 230 companies in the TSE (sharing 37.28%, 230/617, of all TSE-listed firms) and 72 companies in the OTC market (sharing 13.68%, 72/526, of all OTC-listed firms) announced stock repurchase programs during the sample period. The companies were classified by TSE and OTC industry codes and the times of stock repurchase programs. Table 1 presents the results. Table 2 summarizes the TSE-listed and OTC-listed samples, categorized by the stock repurchase program

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[4] The first stock repurchase program was announced by Kwong Fong Industries Corporation (listed in the TSE, SIC Code 1416) to buy back 5,232,000 shares from the open market on August 9, 2000.

issues. The samples consist of 518 issues in TSE-listed firms and 189 issues in OTC-listed firms, respectively[5]. The most active industries in the TSE that announced stock repurchase programs are the electronics and the finance industries, with 114 and 129 issues, respectively. The most active industries listed in the OTC that announced stock repurchase programs are the electronics and the securities industries, with 57 and 78 issues, respectively. Furthermore, to compare each company's abnormal returns, this study does not evaluate issues with incomplete trading data. According to the TSE, there are two kinds of incomplete trading data: (1) stock that is not traded on a given day and (2) only odd stocks traded on a given day. Finally, TSE-listed firms and OTC-listed firms completed 424 and 145 issues of stock repurchases, respectively. The final column of Table 2 presents this information. Table 3 presents the statistics for characteristics of stock repurchase companies. The average capital of TSE-listed companies is larger than that of OTC-listed companies, although their means of targeted repurchase percentage and actual repurchase percentage are not significantly different.

Table 1

Samples of Stock Repurchases Categorized by TSE and OTC Industry Codes

Times of Stock Repurchases	TSE-Listed Industries										OTC-Listed Industries									
	1	2	3	4	5	6	7	8	9	Total	1	2	3	4	5	6	7	8	9	Total
Cement	1	2	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	0
Foods	5	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	0
Plastics	2	2	1	-	-	-	-	-	-	5	1	-	-	-	-	-	-	-	-	1
Textiles	10	3	3	2	-	-	1	-	-	19	2	1	-	1	-	-	-	-	-	4
Electric Machinery	7	3	1	3	-	-	-	-	-	14	2	-	1	2	-	-	-	-	-	5
Electric and Cable	3	1	2	1	-	1	-	-	-	8	-	1	-	-	-	-	-	-	-	1
Chemicals	2	1	3	1	-	-	-	-	-	7	1	-	-	-	-	-	-	-	-	1
Paper and Pulp	1	1	-	-	-	1	-	-	-	3	-	-	-	-	-	-	-	-	-	0
Steel and Iron	6	2	-	1	1	-	-	-	2	12	-	-	-	-	-	-	-	-	-	0
Automobile	1	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	0
Electronics	41	22	5	2	-	1	-	-	-	71	18	12	2	1	1	-	-	-	-	34
Construction	4	7	3	-	2	-	-	-	-	16	2	-	3	-	-	-	-	-	-	5
Transportation	2	-	3	1	-	-	-	-	-	6	1	1	-	-	-	-	1	-	-	3
Tourism	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	0
Finance	9	10	7	5	2	2	4	-	1	40	-	1	-	-	-	1	-	-	-	2
Wholesale and Retail	-	2	1	-	-	-	-	-	1	4	-	-	-	-	-	-	-	-	-	0
Others/Securities	7	5	-	2	-	-	-	-	-	14	-	2	4	2	1	4	1	-	2	16
Total	101	62	29	18	5	6	5	0	4	230	27	18	10	6	2	5	2	0	2	72

Note: The sample in this study includes all listed companies that repurchased stocks from the open market of the TSE and the OTC from August 9, 2000 to January 31, 2002. 230 companies listed in the TSE and 72 companies listed in the OTC. These companies announced stock repurchases during the sample period. Furthermore, the companies were classified by TSE and OTC industry codes and the time frames of stock repurchase periods.

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[5] From January 31, 2002 to December 31, 2002, 258 more companies listed in the TSE repurchased their common stocks (649 issues). The number of companies that executed stock repurchases shares a 40.44 percent (258/638) of the TSE-listed companies in this study. Although a different research period is selected, the empirical results of stock repurchasing signaling effect from both periods are similar.

Table 2
Total Issues of Stock Repurchase Programs (2000/08/09 - 2002/01/31)

TSE-Listed Industries	Number of Companies	Total Issues of Stock Repurchases	Issues with Incomplete Trading Data*	Deduct issues with Incomplete Trading Data
Cement	3	5	0	5
Foods	5	5	0	5
Plastics	5	9	0	9
Textiles	19	40	12	28
Electric & Machinery	14	31	5	26
Electric Appliance & Cable	8	20	4	16
Chemicals	7	17	6	11
Paper & Pulp	3	9	1	8
Steel and Iron	12	37	8	29
Automobile	2	3	1	2
Electronics	71	114	18	96
Construction	16	37	6	31
Transportation	6	15	2	13
Tourism	1	6	6	0
Finance	40	129	19	110
Wholesale & Retail	4	16	4	12
Others	14	25	2	23
Total	230	518	94	424

OTC-Listed Industries	Number of Companies	Total Issues of Stock Repurchases	Issues with Incomplete Trading Data*	Deduct Issues with Incomplete Trading Data
Plastics	1	1	1	0
Textiles	4	8	4	4
Electric & Machinery	5	13	4	9
Electric Appliance & Cable	1	2	2	0
Chemicals	1	1	1	0
Electronics	34	57	18	39
Construction	5	11	1	10
Transportation	3	10	4	6
Finance	2	8	0	8
Securities	16	78	9	69
Total	72	189	44	145

*According to the TSE, there are two kinds of incomplete trading data: (1) stocks that is not traded on a given day and (2) only odd stocks is traded on a given day.
Source: TSE, OTC and TEJ.

Table 3
Summary Statistics for Characteristics of Stock Repurchasing Companies

Firms Listed in the TSE	Mean	Median	Standard Deviation	Maximum	Minimum	Mean Difference between TSE and OTC (t-value)
Targeted Repurchase %(n=424)	2.75	2.29	1.94	10.00	0.28	0.84
Actual Repurchase %(n=424)	1.69	1.33	1.46	9.84	0.00	0.50
Times of Repurchase(n=230)	2.52	2.0	2.73	9.0	1.0	-0.32
Company Capital (Million NT$)(n=230)	8,960	5,654	8,012	65,228	852	6.71***
Firms Listed in the OTC	Mean	Median	Standard Deviation	Maximum	Minimum	
Targeted Repurchase %(n=145)	2.59	3.10	2.06	10.00	0.00	
Actual Repurchase %(n=145)	1.61	1.28	1.41	9.20	0.00	
Times of Repurchase (n=72)	2.63	2.0	2.74	9.0	1.0	
Company Capital (Million NT$)(n=72)	1,783	629	1,202	37,840	330	

Note: The ratios of targeted repurchase and actual repurchase are calculated based on the issues of stock repurchases (issues of stock repurchases at TSE-listed firms =424, issues of stock repurchases at OTC-listed firms =145). Times of stock repurchases and company capital are calculated based on number of companies (number of TSE-listed firms =230, number of OTC-listed firms =72). Company Capital is measured based on the initial stock repurchase program.
***Significant at a 1-percent level.

If a company executes several stock repurchase programs within the sample period, the overlapping of event window will cause the signaling effects that cannot be measured accurately. This study uses two methods to solve the problem of calculating the abnormal returns of each stock repurchase program. The first method is to fix the estimation method from 276 business days to 11 business days before the announcement date of first stock repurchase program. The second method is to vary the estimation method from 276 business days to 11 business days before the announcement date of each stock repurchase program. Because this paper sets event window from 276 business days to 11 business days before the announcement date of stock repurchase program, the floating estimation method can not solve the problem of overlapping of event window completely. However, we expect the floating estimation method can get a more accurate CAAR than the fixed estimation method does. Hypothesis I only uses the fixed estimation method to measure abnormal return. However, Hypotheses II, III, and IV measure abnormal returns using both methods.

2.3 Model

The following section uses an event study to examine the hypotheses. The event is the company's announcement and expiration of stock repurchase program. When a listed company's the board of directors decides to execute a stock repurchase program, they must disclose the decision to the public in two business days (the meeting day is not included). The date of the announcement may be set on the day the board meets, the next day, or two business days following the meeting. Here the event date (A=0) is the day the board announces a stock repurchase program. The date of expiration (E=0) is the day to finish the stock repurchase program, decided by the board in advance. Because each stock repurchase program must be executed within two months, the expiration date was set as A = +44 (as two months contains approximately 44 business days). There are various methods to measure the average abnormal return (AAR) and the cumulative average abnormal return (CAAR). This study uses the market model to measure both returns. The calculation of AAR and CAAR is as follows.

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \qquad \ldots\ldots\ldots\ldots \quad (1)$$

where

R_{it}: the rate of return of the ith security on date t.

R_{mt}: the rate of return of market portfolio on date t.

α_i, β_i: the coefficient of regression equation.

ε_{it}: residual item, ε_{it} obeys normal distribution.

This study uses historical data of stock price and the ordinary least squares method to estimate α_i and β_i in Eq. (1). Equation (2) then estimates the normal return ($\hat{R}_{it}$), while Eq. (3) calculates abnormal return (AR_{it}).

$$\hat{R}_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt} \qquad \ldots\ldots\ldots\ldots \quad (2)$$

$$AR_{it} = R_{it} - \hat{R}_{it} \qquad \ldots\ldots\ldots\ldots \quad (3)$$

According to the former estimation, the cross-sectional averages of each security's abnormal return and the average abnormal return (AAR_t) of all samples can be calculated as

$$AAR_t = \sum_{i=1}^{N} \frac{AR_{it}}{N} \qquad \ldots\ldots\ldots\ldots \quad (4)$$

Where

N: the number of samples.

To measure the persistence of a signaling effect during the event period, this

study uses the cumulative average abnormal return ($CAAR_{t_1,t_2}$) to estimate the persistence of the signaling effect. The event period is from t_1 to t_2,

$$CAAR_{t_1,t_2} = \sum_{t=t_1}^{t_2} AAR_t \quad \ldots\ldots\ldots\ldots \quad (5)$$

Where

   t_1: the first day of the event window.

   t_2: the last date of the event window.

   Vermaelen (1981) found that the stock repurchases information was usually leaked before the information was formally disclosed. He found that the stock price increases four days before the announcement date and produces significantly positive CAR two days after the announcement date. If information is leaked before the announcement date, the AAR over the pre-announcement window should be positive. Furthermore, when a listed company decides to execute a stock repurchase program, it must disclose the decision to the public within two business days (the meeting day is not included). Therefore, this study sets the announcement window from two days before the announcement date to two days after the announcement date. The estimation method of this study is one fiscal year;, or about 266 business days,[6] from A = -276 to A = -11. To match the hypothesis test of this study, the windows are defined as follows:

   (1) Estimation window: A = -276 to A = -11.
   (2) Pre-event window: A = -10 to A = -3.
   (3) Announcement window: A = -2 to A = +2.
   (4) Execution window: A = +3 to E = -3.
   (5) Expiration window: E = -2 to E = +2.

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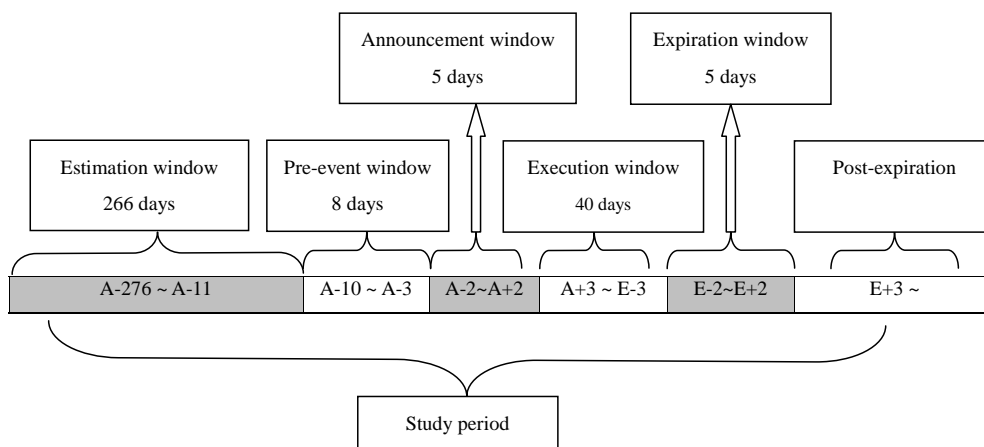
[6] The average number of business days between 2000 (271 days) and 2001 (262 days).

3. Empirical Results

3.1 Hypothesis I

The AAR and CAAR were computed from samples listed in the TSE and the OTC markets, respectively. Table 4 summarizes the results. The left panel of Table 4 relates to TSE-listed firms, showing that the CAAR over pre-event window (A = -10 to A = -3) is significantly negative. The AAR was calculated over the first half of the announcement window (A = -2 to A = -1), showing that the AAR on A = -2 and A = -1 are -0.50% and -0.14%, respectively, neither of which is significant. However, the CAAR (A = -2 to A = -1) is -0.65%, which is significantly negative at the 5% level. The TSE-listed firms provide full support for the information leakage hypothesis presented by Vermaelen (1981). The daily AAR values from A = 0 to A = +2 are 0.35%, 1.90%, and 1.75%, respectively, significant on A = +1 and A = +2. This shows that there are significantly positive signaling effects over the second half of the announcement window (A = 0 to A = +2). The CAAR of stock repurchase programs during the execution window (A = +3 to E = -3) is 12.18%, which is significant at the 1% level. Investors can predict the expiration date of a repurchase program when it is announced because each stock repurchase program can only be two months. Therefore, when companies announce expiration date of stock repurchase programs, it should not be a surprise to investors. However, the realized CAAR (E = -2 to E = +2) during the expiration window is 0.41%, which is not significant at the 10% level. The AAR on E = 0 is 0.53%, which is significant at the 5% level. These results show that TSE-listed firms that announce stock repurchase send a positive signaling effect to the market, as does the announcement of the execution window.

The right panel of Table 4 presents the empirical results for the OTC-listed firms. The CAAR over the pre-event window (A = -10 to A = -3) is not significantly negative. The AAR values over the first half of the announcement window (A = -2 and A = -1) are 0.24% and 0.04%, respectively, neither of which is significant at the 10% level. However, the AAR values from A = 0 to A = +2 are 1.07%, 1.79%, and 1.36%, respectively, all of which are significant at the 1% level. The CAAR (A = -2 to A = +2) is 4.51% over the announcement window, which is significant at the 1% level. The CAAR during the execution window (A = +3 to E = -3) is 9.29%, which is significant at the 1% level. The CAAR during the expiration window (E = -2 to E

= +2) is 1.65%, which is significant at the 10% level.

Table 4
TSE-Listed and OTC-Listed Firms' AAR and CAAR During Stock Repurchase Programs

	Issues of TSE-Listed Firms (n=424)				Issues of OTC-Listed Firms (n=145)			
Date	AAR	t-value	CAAR	t-value	AAR	t-value	CAAR	t-value
A-10 ~ A-3	-	-	-0.0367	-5.378***	-	-	-0.0111	-0.806
A-2	-0.0050	-2.219**	-0.0050	-2.219**	0.0024	0.607	0.0024	0.607
A-1	-0.0014	-0.635	-0.0065	-1.717**	0.0004	0.100	0.0028	0.484
A-0	0.0035	1.421	-0.0030	-0.659	0.0107	2.670***	0.0135	1.799**
A+1	0.0190	8.290***	0.0160	2.888***	0.0179	3.427***	0.0315	3.030***
A+2	0.0175	6.900***	0.0335	5.229***	0.0136	2.681***	0.0451	3.524***
A+3 ~ E-3	-	-	0.1218	6.732***	-	-	0.0929	3.597***
E-2	0.0021	0.886	0.0021	0.886	0.0027	0.700	0.0027	0.700
E-1	-0.0028	-1.076	-0.0006	-0.160	0.0090	1.893**	0.0118	1.567*
E-0	0.0053	2.040**	0.0046	0.776	0.0060	1.603*	0.0179	2.107**
E+1	-0.0016	-0.618	0.0030	0.408	-0.0002	-0.092	0.0176	1.936**
E+2	-0.0011	0.379	0.0041	0.458	-0.0010	-0.276	0.0165	1.618*

*Significant at a 10-percent level, **Significant at a 5-percent level, ***Significant at a 1-percent level.

3.2 Hypothesis II

The positive signaling effect and the abnormal returns of the stock prices should gradually decline as the number of stock repurchase programs increases. To measure the signaling effect of stock repurchase programs accurately, this study uses the fixed and the floating estimation methods to evaluate abnormal returns. The top left panel in Table 5 presents the CAAR (A = -2 to A = +2) during the announcement window of TSE-listed firms based on the fixed estimation window. During the announcement window, the CAAR (A = -2 to A = +2) of stock repurchase programs, from the first to the fourth times are 3.35%, 2.26%, 2.26%, and 4.88%, respectively. All of these values are significant at the 5% level. The announcement of stock repurchases sends significantly positive signals to investors.

There is no significantly positive signaling effect of stock repurchases after the fifth time a company announces a stock repurchase program. The CAAR values (A = -2 to A = +2) of a stock repurchase program, from the fifth to the ninth time, are 0.97%, 2.01%, 2.16%, -2.58%, and 2.83%, respectively. None of these values are significant. However, the CAAR (A = -2 to A = +2) of the eighth stock repurchase

program announcement is -2.58%, which is significantly negative at the 5% level. This result shows that after five stock repurchase programs, the announcement of sequential stock repurchase programs does not have consistently positive signaling effects on the market. The lower left panel in Table 5 presents the test results of OTC-listed firms; the CAAR of the first, second, and fifth time stock repurchase program are 4.51%, 3.48%, and 3.51%, respectively, all of which are significant at the 5% level. However, the CAAR (A = -2 to A = +2) of other stock repurchase programs is not statistically significant.

This study compares the differences in CAAR (A = -2 to A = +2) between sequential stock repurchase programs of TSE-listed firms, and presents the results in the final column of the top left panel in Table 5. The CAAR should decline gradually as the times of stock repurchase programs increases. Table 5 indicates that the CAAR (A = -2 to A = +2) values of the fourth and seventh stock repurchase programs are significantly larger than those of the fifth and eighth programs, respectively. However, the CAAR (A = -2 to A = +2) values of the third and eighth stock repurchase programs are significantly smaller than those of the fourth and ninth programs. Furthermore, the CAAR between other sequential stock repurchase programs is not significantly different. According to these results, it is not possible to obtain consistent support for Hypothesis II from TSE-listed firms. The lower left panel of Table 5 presents the test results of OTC-listed firms. The CAAR values (A = -2 to A = +2) of the second and fifth stock repurchase programs are significantly larger than those of the third and sixth programs, respectively. However, the CAAR differences between other sequential stock repurchase programs are not significantly different. The OTC-listed firms do not provide support for Hypothesis II either.

The right panel of Table 5 presents the CAAR (A = -2 to A = +2) based on the floating estimation method during the announcement window. The top right panel of Table 5 presents the CAAR (A = -2 to A = +2) of TSE-listed firms. During the announcement window, the CAAR (A = -2 to A = +2) values of the first, second, and fourth stock repurchase programs are 3.35%, 1.78%, and 3.87%, respectively, all of which are significant at the 5% level. However, the CAAR (A = -2 to A = +2) of other stock repurchase programs is not significantly positive. On the contrary, the CAAR (A = -2 to A = +2) of the eighth stock repurchase program is -1.21%, which is significantly negative at the 5% level. This study also compares the CAAR (A =

-2 to A = +2) differences between sequential stock repurchase programs based on the floating estimation method. These test results are similar to those of the fixed estimation method, and do not provide consistent support for Hypothesis II.

The lower right panel of Table 5 presents the test results of the OTC-listed firms based on the floating estimation method. A company will stop stock repurchasing upon reaching its targeted repurchase volume. The CAAR (A = -2 to A = +2) of the first and second stock repurchase programs are 4.51% and 2.84%, respectively, both of which are significant at the 5% level. However, the CAAR (A = -2 to A = +2) after the third stock repurchase program is statistically insignificant. The CAAR (A = -2 to A = +2) differences between sequential stock repurchase programs is also calculated based on the floating estimation method of the OTC-listed firms. There is a significant difference only between the second and third stock repurchase programs. Results from the OTC-listed firms do not support Hypothesis II.

When the first stock repurchase program is announced, stockholders will get a significantly positive abnormal return over the announcement window (A = -2 to A = +2). This finding agrees with previous literature (Ikenberry et al., 1995; Raad and Wu, 1995). If the companies announce a second stock repurchase program, the strength of the signaling effect over the announcement window decreases. However, after a stock repurchase program is executed up to three times, the abnormal return over the announcement window is not always positive. There is no consistent evidence supporting Hypothesis II that the abnormal return will be positive, but declines gradually as the stock repurchase programs of the same firm increase.

Table 5
Test for CAAR (A = -2 to A = +2) of Stock Repurchase at Announcement
Window Based on the Fixed/Floating Estimation Methods

		Based on the Fixed Estimation Method			Based on the Floating Estimation Method		
TSE-Listed Firms	Issues	CAAR	t-value	t-value	CAAR	t-value	t-value
1st Time	195	0.0335	5.229***	-	0.0335	5.229***	-
1st and 2nd Test	-	-	-	1.042	-	-	1.524*
2nd Time	110	0.0226	2.842***	-	0.0178	2.312**	-
2nd and 3rd Test	-	-	-	0.003	-	-	0.684
3rd Time	57	0.0226	2.330**	-	0.0090	0.949	-
3rd and 4th Test	-	-	-	-1.632*	-	-	-1.919**
4th Time	27	0.0488	4.341***	-	0.0387	3.618***	-
4th and 5 thTest	-	-	-	2.131**	-	-	1.837**
5th Time	16	0.0097	0.666	-	0.0058	0.369	-
5th and 6th Test	-	-	-	-0.465	-	-	0.092
6th Time	10	0.0201	1.118	-	0.0035	0.167	-
6th and 7thTest	-	-	-	-0.060	-	-	-0.175
7th Time	5	0.0216	1.100	-	0.0089	0.658	-
7th and 8th Test	-	-	-	2.229**	-	-	1.323
8th Time	3	-0.0258	-2.881**	-	-0.0121	-2.597**	-
8th and 9th Test	-	-	-	-3.537***	-	-	-3.925***
9th Time	1	0.0283	-	-	0.0289	-	-
OTC-Listed Firms	Issues	CAAR	t-value	t-value	CAAR	t-value	t-value
1st Time	48	0.0451	3.524***	-	0.0451	3.524***	-
1st and 2nd Test	-	-	-	0.572	-	-	0.943
2nd Time	34	0.0348	3.123***	-	0.0284	2.353**	-
2nd and 3rd Test	-	-	-	1.568*	-	-	1.550*
3rd Time	24	0.0046	0.278	-	-0.0017	-0.115	-
3rd and 4th Test	-	-	-	-0.618	-	-	-0.522
4th Time	14	0.0194	1.506	-	0.0100	0.603	-
4th and 5th Test	-	-	-	0.765	-	-	-0.596
5th Time	11	0.0351	2.154**	-	0.0248	1.360	-
5th and 6th Test	-	-	-	1.553*	-	-	0.858
6th Time	8	-0.0045	-0.227	-	0.0006	0.028	-
6th and 7th Test	-	-	-	-0.255	-	-	0.076
7th Time	3	0.0046	0.200	-	-0.0017	-0.080	-
7th and 8th Test	-	-	-	0.532	-	-	0.115
8th Time	2	-0.0126	-0.767	-	-0.0052	-0.240	-
8th and 9th Test	-	-	-	0.303	-	-	0.482
9th Time	1	-0.0213	-	-	-0.0141	-	-

*Significant at a 10-percent level, **Significant at a 5-percent level, ***Significant at a 1-percent level.

Table 6 presents the CAAR (A = +3 to E = -3) of stock repurchases over the execution window. The top left panel in Table 6 presents the CAAR (A = +3 to E = -3) of TSE-listed firms based on the fixed estimation method. The CAAR (A = +3 to E = -3) values of the first to fifth stock repurchase programs are 12.18%, 11.47%, 6.91% , 9.73%, and 7.32%, respectively, which are significant at the 5% level. However, the CAAR over the execution window after the sixth stock repurchase program is not statistically significant. Furthermore, for the CAAR (A = +3 to E = -3) difference between sequential stock repurchase programs, the significant difference is only between the fifth and the sixth stock repurchase programs. The lower left panel in Table 6 presents the CAAR (A = +3 to E = -3) of OTC-listed firms based on the fixed estimation method. The positive abnormal return does not decrease consistently as the times of stock repurchase programs increases. The fixed estimation method provides no support for Hypothesis II based on TSE-listed firms or OTC-listed firms.

This study also uses the floating estimation method to examine the CAAR (A = +3 to E = -3) over the execution window for TSE-listed firms and the OTC-listed firms. The right panel in Table 6 presents the results, which are similar to those based on the fixed estimation method. The fixed estimation method provides no support for Hypothesis II based on CAAR (A = +3 to E = -3) results.

Table 6
Test for CAAR (A=+3 to E=-3) of Stock Repurchases at Execution Window
Based on the Fixed/Floating Estimation Window

		Based on the Fixed Estimation Window			Based on the Floating Estimation Window		
TSE-Listed Firms	Issues	CAAR	t-value	t-value	CAAR	t-value	t-value
1st Time	195	0.1218	6.732***	-	0.1218	6.732***	-
1st and 2nd Test	-	-	-	0.325			0.576
2nd Time	110	0.1147	3.992***	-	0.1039	3.981***	-
2nd and 3rd Test	-	-	-	1.026			1.029
3rd Time	57	0.0691	3.291***	-	0.0622	2.64***	-
3rd and 4th Test	-	-	-	-0.769			-0.309
4th Time	27	0.0973	3.288***	-	0.0739	2.869***	-
4th and 5 thTest	-	-	-	0.527			0.917
5th Time	16	0.0732	2.523**	-	0.0373	1.230	-
5th and 6th Test	-	-	-	1.569*			1.460*
6th Time	10	0.0028	0.105	-	-0.0028	-0.743	-
6th and 7thTest	-	-	-	-0.290			-0.672
7th Time	5	0.0197	0.314	-	0.0081	0.180	-
7th and 8th Test	-	-	-	-0.348			0.120
8th Time	3	0.0526	1.277	-	0.0026	1.504	-
8th and 9th Test	-	-	-	0.492			1.040
9th Time	1	-0.0047	-	-	-0.0014	-	-
OTC-Listed Firms	Issues	CAAR	t-value	t-value	CAAR	t-value	t-value
1st Time	48	0.0929	3.597***	-	0.0929	3.597***	-
1st and 2nd Test	-	-	-	-0.826	-	-	0.836
2nd Time	34	0.1263	4.019***	-	0.0562	1.585*	-
2nd and 3rd Test	-	-	-	1.030	-	-	0.733
3rd Time	24	0.0741	1.819	-	0.0170	0.429	-
3rd and 4th Test	-	-	-	-0.509	-	-	-0.430
4th Time	14	0.1073	2.176**	-	0.0458	0.854	-
4th and 5th Test	-	-	-	1.666*	-	-	1.127
5th Time	11	-0.0176	-0.311	-	-0.0437	-0.747	-
5th and 6th Test	-	-	-	-1.172	-	-	0.187
6th Time	8	0.0803	1.358	-	-0.0573	-1.337	-
6th and 7th Test	-	-	-	0.146	-	-	-0.480
7th Time	3	0.0630	0.551	-	-0.0140	-0.178	-
7th and 8th Test	-	-	-	0.538	-	-	0.325
8th Time	2	-0.0764	-0.268	-	-0.0726	-0.450	-
8th and 9th Test	-	-	-	-1.116	-	-	-2.094
9th Time	1	0.4758	-	-	0.2833	-	-

*Significant at a 10-percent level, **Significant at a 5-percent level, ***Significant at a 1-percent level.

3.3 Hypothesis III

If a company's stock price increases when its stock repurchase program is executed, the company will be more than likely to exercise sequential stock repurchase programs. Additionally, the realized abnormal returns of companies announcing another stock repurchase program should be larger than those of companies not announcing a subsequent stock repurchase program. Therefore, this study divides the sample into two groups, the continuous stock repurchase group and the non-continuous stock repurchase group, to compare CAAR (A = -2 to E = -3) differences between them. Table 7 presents the test results based on the fixed estimation method for the TSE-listed firms.

The CAAR (A = -2 to A = +2) of the continuous group in the TSE-listed firms is larger than that of the non-continuous group for the first, third, fourth, fifth, sixth and eighth stock repurchase programs, and a significant difference is seen during the first and fifth program periods (Table 7). Throughout the execution period, the CAAR (A = +3 to E = -3) of the continuous group in the TSE-listed firms is larger than that of the non-continuous group for all stock repurchase programs, except for the second time a stock repurchase program was announced. However, the only significant difference appears between the first and third stock repurchase programs.

Table 8 presents test results based on the fixed estimation method for the OTC-listed firms. The CAAR (A = -2 to A = +2) of the continuous group is larger than that of the non-continuous group for the first, third, fourth, seventh and eighth stock repurchase programs. However, the only significant difference appears between the first and fourth stock repurchase programs. On the contrary, the CAAR (A = -2 to A = +2) of the continuous group is insignificantly smaller than that of the non-continuous group for the second, fifth, and sixth stock repurchase programs. For the window of execution period, the CAAR (A = +3 to E = -3) of the continuous group in the OTC-listed firms is larger than that of the non-continuous group for the third, fourth, sixth, and seventh stock repurchase programs. However, a significant difference only appeared between the third and fourth stock repurchase programs. In contrast, the CAAR (A = +3 to E = -3) of the continuous group in the OTC-listed firms is smaller than that of the non-continuous group for other stock repurchase programs.

This study performs the same test in the previous section using the floating estimation method (the results are not shown). For the TSE-listed firms, the CAAR (A = -2 to A = +2) of the continuous group is larger than that of the non-continuous group for the first, second, third, and seventh stock repurchase programs. Conversely, the CAAR (A = -2 to A = +2) of the continuous group is lower than that of the non-continuous group during other times for stock repurchase programs. These test results are similar to those seen for the fixed estimation method used in the former section. For the OTC-listed firms, the CAAR (A = -2 to A = +2) of the continuous group is significantly larger than that of the non-continuous group during the fourth stock repurchase program only. Thus, there is no consistent evidence supporting Hypothesis III.

Table 7

Difference of AAR Between Non-continuous and Continuous Group Based on the Fixed Estimation Method for TSE-Listed Firms

	First Time			Second Time			Third Time			Forth Time		
	Non-continuous Group (n=85)	Continuous Group (n=110)	t-value	Non-continuous Group (n=53)	Continuous Group (n=57)	t-value	Non-continuous Group (n=30)	Continuous Group (n=27)	t-value	Non-continuous Group (n=11)	Continuous Group (n=16)	t-value
A-2	-0.0072	-0.0035	-0.820	-0.0010	-0.0028	0.048	0.0027	-0.0060	1.111	-0.0056	0.0124	-1.776**
A-1	-0.0045	0.0007	-1.080	-0.0001	-0.0065	0.024	-0.0022	-0.0064	1.337*	0.0049	0.0102	-0.570
A-0	0.0010	0.0051	-0.700	-0.0003	0.0003	-0.249	-0.0027	0.0098	-0.904	0.0118	0.0075	0.431
A+1	0.0168	0.0206	-0.460	0.0135	0.0117	0.650	0.0118	0.0090	0.444	0.0121	0.0142	-0.214
A+2	0.0127	0.0208	-1.350*	0.0112	0.01941	-0.680	0.0074	0.0115	-0.498	0.0205	0.0077	1.235
A-2~A+2	0.0188	0.0438	-1.653**	0.0232	0.0220	0.102	0.0069	0.0178	-0.455	0.0438	0.0522	-0.348
A+3~E-3	0.0937	0.1413	-1.430*	-0.1046	-0.1211	0.105	0.0157	0.1285	-2.780***	0.9597	0.9823	-0.035
	Fifth Time			Sixth Time			Seventh Time			Eighth Time		
	Non-continuous Group (n=6)	Continuous Group (n=10)	t-value	Non-continuous Group (n=5)	Continuous Group (n=5)	t-value	Non-continuous Group (n=2)	Continuous Group (n=3)	t-value	Non-continuous Group (n=2)	Continuous Group (n=1)	t-value
A-2	-0.0118	-0.0043	-0.603	-0.0002	0.0171	-0.769	-0.0319	-0.0052	-1.012	-0.0210	0.0060	-3.600*
A-1	-0.0156	0.0093	-2.247**	-0.0009	-0.0002	-0.074	0.0200	0.0022	1.142	0.0100	0.0110	-0.166
A-0	-0.0153	0.0074	-2.406**	0.0109	-0.0101	1.257	0.0181	0.0061	1.101	-0.0310	-0.0140	-0.362
A+1	0.0052	0.0201	-1.370*	0.0045	0.0083	-0.202	0.0182	0.0010	0.335	0.0150	-0.0020	8.300**
A+2	-0.0028	0.0071	-0.806	0.0027	0.0082	-0.481	0.0000	0.0161	-1.372	-0.1010	-0.0210	2.500
A-2~A+2	-0.0403	0.0397	-3.166***	0.0169	0.0232	-0.165	0.0245	0.0190	0.105	-0.0290	-0.0190	-0.275
A+3~E-3	0.0689	0.0758	-0.105	-0.0024	0.0081	-0.181	-0.0456	0.0630	-0.810	0.0250	0.1330	-0.950

*Significant at a 10-percent level, **Significant at a 5-percent level, ***Significant at a 1-percent level.

Table 8

Difference of AAR Between Non-continuous and Continuous Group Based on the Fixed Estimation Method for OTC-Listed Firms

	First Time			Second Time			Third Time			Forth Time		
	Non-continuous Group (n=14)	Continuous Group (n=34)	t-value	Non-continuous Group (n=10)	Continuous Group (n=24)	t-value	Non-continuous Group (n=10)	Continuous Group (n=14)	t-value	Non-continuous Group (n=3)	Continuous Group (n=11)	t-value
A-2	0.0038	0.0018	0.247	-0.0006	-0.0058	0.528	-0.0041	-0.0007	-0.375	0.0130	0.0142	-0.049
A-1	-0.0081	0.0039	-1.371*	-0.0111	0.0081	-1.449*	-0.0129	-0.0046	-0.755	-0.0219	0.0034	-5.757***
A-0	0.0006	0.0149	-1.564*	0.0091	0.0045	0.395	-0.0044	-0.0005	-0.376	-0.0244	0.0026	-0.866
A+1	0.0146	0.0192	-0.389	0.0242	0.0103	1.258	0.0163	0.0100	0.431	0.0026	0.0144	-0.394
A+2	0.0007	0.0189	-1.580*	0.0169	0.0156	0.118	0.0028	0.0087	-0.640	0.0030	-0.0008	0.280
A-2~A+2	0.0116	0.0589	-1.668*	0.0385	0.0328	0.213	-0.0024	0.0129	-0.471	-0.0276	0.0339	-2.264**
A+3~E-3	0.0994	0.0902	0.126	0.1641	0.1057	0.752	-0.0056	0.1684	-2.442**	-0.0978	0.1687	-2.226**
	Fifth Time			Sixth Time			Seventh Time			Eighth Time		
	Non-continuous Group (n=3)	Continuous Group (n=5)	t-value	Non-continuous Group (n=5)	Continuous Group (n=3)	t-value	Non-continuous Group (n=1)	Continuous Group (n=2)	t-value	Non-continuous Group (n=1)	Continuous Group (n=1)	t-value
A-2	0.0057	0.0005	0.337	0.0008	0.0137	-1.072	-0.0104	0.0052	-0.660	0.0063	-0.0270	-
A-1	0.0099	0.0045	0.297	-0.0054	-0.0120	0.676	0.0002	0.0044	-0.188	-0.0009	0.0075	-
A-0	0.0215	0.0044	1.293	-0.0035	-0.0283	0.997	0.0142	-0.0333	3.850***	-0.0074	0.0455	-
A+1	-0.0075	0.0169	-2.411**	0.0124	0.0012	0.749	-0.0124	0.0326	3.212***	-0.0027	-0.0168	-
A+2	0.0153	0.0076	0.514	0.0065	-0.0047	0.564	-0.0072	0.0058	-0.215	-0.0244	-0.0054	-
A-2~A+2	0.0450	0.0341	0.314	0.0109	-0.0301	1.326	-0.0155	0.0147	-0.884	-0.0292	0.0038	-
A+3~E-3	0.0729	-0.0489	1.309	0.0767	0.0865	-0.070	-0.1659	0.1776	-4.521***	0.2092	-0.3621	-

*Significant at a 10-percent level, **Significant at a 5-percent level, ***Significant at a 1-percent level.

3.4 Hypothesis IV

This study examines the completion rate (the ratio of the *number of actual stock repurchase/ number of targeted stock repurchase*) to test the strength of the signaling effects on stock repurchases. The sample was divided into the continuous stock repurchase group and the non-continuous stock repurchase group. The completion rate of the continuous group should be lower than that of the non-continuous group. This study uses two methods to measure the completion rate accurately. The first method calculates the rate using the same weight (arithmetic average) for all companies. The second method calculates the rate using the capital weighted average by each company's market capital. Table 9 lists the completion rates of the TSE-listed and the OTC-listed firms classified into ten ranges, from low to high.

Table 10 presents the differences of completion rates between the non-continuous group and the continuous group based on the arithmetic average and the capital weighted average methods. The top panel in Table 10 presents the test results using the arithmetic average method. These results cannot provide statistically significant support for Hypothesis IV for either the TSE-listed firms or the OTC-listed firms. The lower panel of Table 10 lists the completion rate as calculated by the capital weighted average method. In the lower left panel in Table 10, the TSE-listed firms with completion rate for the non-continuous stock repurchase group is significantly larger than that of the continuous stock repurchase group during the first, second, and fourth stock repurchase programs. However, the completion rate of the non-continuous stock repurchase group is significantly lower than that of the continuous stock repurchase group for the sixth stock repurchase program. Note that the completion rate is not significant for other stock repurchase programs. In the lower right panel in Table 10, the completion rate of the OTC-listed firms shows no significant difference between the continuous group and the non-continuous group for all stock repurchase programs. The test results in Table 10 provide no consistent support for Hypothesis IV.

Table 9

Completion Rate of TSE-Listed and OTC-Listed Firms

Completion Rate (Number of Actual Stock Repurchase/Number of Targeted Stock Repurchase)	TSE-Listed Firms		OTC-Listed Firms	
	Issues	%	Issues	%
0	11	2.6	18	12.4
0-10%	23	5.4	11	7.6
10-20%	27	6.4	19	13.1
20-30%	26	6.1	10	6.9
30-40%	26	6.1	8	5.5
10-50%	26	6.1	8	5.5
50-60%	24	5.7	5	3.4
60-70%	16	3.8	5	3.4
70-80%	32	7.5	8	5.5
80-90%	27	6.4	11	7.6
90-100%	43	10.1	8	5.5
100%	143	33.8	34	23.6
Total	424	100	145	100

Source: TSE, OTC and TEJ.

Table 10

Completion Rate Between Non-continuous and Continuous Groups Based on Arithmetic Average and Capital Weighted Average Methods

Arithmetic Average	TSE -Firms	Mean of Non-continuous Group	Mean of Continuous Group	t-value	OTC-Firms	Mean of Non-continuous Group	Mean of Continuous Group	t-value
1st time	195	0.6102	0.6365	-0.489	145	0.5821	0.5910	-0.071
2nd time	110	0.6928	0.6453	0.739	96	0.5237	0.7345	-1.551
3rd time	57	0.7592	0.7912	-0.394	62	0.5641	0.5189	0.273
4th time	27	0.7468	0.7897	-0.326	38	0.3956	0.4412	0.340
5th time	16	0.7839	0.7375	0.281	24	0.3956	0.4412	-0.135
6th time	10	0.7984	0.8692	-0.471	13	0.4298	0.5847	-0.507
7th time	5	0.9019	0.8686	0.211	5	0.4353	0.2466	0.279
8th time	3	0.9997	0.7889	0.237	2	0.3854	0.2000	0.242
Capital Weighted Average	TSE -Firms	Mean of Non-continuous Group	Mean of Continuous Group	t-value	OTC-Firms	Mean of Non-continuous Group	Mean of Continuous Group	t-value
1st time	195	0.0322	0.0162	1.83**	145	0.0195	0.0132	1.303
2nd time	110	0.0185	0.0150	1.437*	96	0.0176	0.0107	1.074
3rd time	57	0.0151	0.0166	-0.549	62	0.0229	0.0185	0.567
4th time	27	0.0176	0.0118	1.435*	38	0.0122	0.0092	0.857
5th time	16	0.0150	0.0120	0.515	24	0.0098	0.0464	-1.000
6th time	10	0.0091	0.0157	-1.703*	13	0.0135	0.0157	-0.247
7th time	5	0.0107	0.0127	-0.917	5	0.0025	0.0276	-0.501
8th time	3	0.0169	0.0115	0.403	2	0.0183	0.0126	0.032

3.5 Additional Test

In order to confirm whether our test results of Hypotheses coming from investor's naïve for stock repurchases or not, we extend our study period from August, 2000 to December, 2008 and do an additional test based on the floating estimation method.

The sample included all listed companies that repurchased stocks from the open market in the TSE and the OTC from August 9, 2000 to December 31, 2008. Results show that 340 companies in the TSE and 146 companies in the OTC market announced stock repurchase programs during the sample period. The companies were classified by TSE and OTC industry codes and the times of stock repurchase programs. Table 11 presents the results. Table 12 summarizes the TSE-listed and OTC-listed samples, categorized by the stock repurchase program issues.

Table 11
Total Issues of Stock Repurchase Programs with Complete Data
(2000/08/09 - 2008/12/31)

Exchange	TSE-listed Companies		OTC-listed Companies	
Industries	Number of Companies	Total Issues of Stock Repurchases	Number of Companies	Total Issues of Stock Repurchases
Cement	5	17	-	-
Foods	5	19	0	0
Plastics	10	37	1	1
Textiles	22	66	1	1
Electric & Machinery	15	48	6	21
Electric Appliance & Cable	8	39	0	0
Chemicals	14	40	5	8
Paper & Pulp	3	17	-	-
Steel and Iron	12	47	-	-
Fiber	3	11	–	-
Automobile	3	8	-	-
Electronics	185	661	116	296
Construction	1	7	4	8
Transportation	20	58	1	6
Tourism	6	14	0	0
Finance	0	0	2	13
Wholesale & Retail	20	111	2	3
Others	5	36	5	9
Monitored Stocks	-	-	2	2
Total	340	1243	146	368

Note: According to the TSE, there are two kinds of incomplete trading data: (1) stocks that is not traded on a given day and (2) only odd stocks is traded on a given day.
Source: TSE, OTC and TEJ.

Table 12

Summary Statistics for Characteristics of Stock Repurchasing Companies (2000/08/09 - 2008/12/31)

Firms Listed in the TSE	Mean	Median	Standard Deviation	Maximum	Minimum	Mean Difference between TSE and OTC (t-value)
Targeted Repurchase %(n=1243)	2.79	2.37	1.93	10.04	0.09	-2.62***
Actual Repurchase %(n=1243)	1.82	1.48	1.51	9.84	0.00	-2.11**
Times of Repurchase(n=340)	3.90	3.00	3.87	30.00	1.00	3.03***
Company Capital (Million NT$)(n=340)	8,469	3,238	20,177	264,262	513	3.51***
Firms Listed in the OTC	Mean	Median	Standard Deviation	Maximum	Minimum	
Targeted Repurchase %(n=368)	3.18	2.91	1.98	20.40	0.24	
Actual Repurchase %(n=368)	2.01	1.81	1.52	7.69	0.00	
Times of Repurchase (n=146)	2.84	2.00	2.56	16.00	1.00	
Company Capital (Million NT$)(n=146)	2,367	837	8,673	78,229	108	

Note: The ratios of targeted repurchase and actual repurchase are calculated based on the issues of stock repurchases (issues of stock repurchases at TSE-listed firms =1243, issues of stock repurchases at OTC-listed firms =368). Times of stock repurchases and company capital are calculated based on number of companies (number of TSE-listed firms =340, number of OTC-listed firms =146). Company Capital is measured based on the initial stock repurchase program.

***Significant at a 1-percent level, **Significant at a 5-percent level.

The top left panel in Table 13 presents the CAAR (A = -2 to A = +2) during the announcement window of TSE-listed firms. During the announcement window, the CAAR (A = -2 to A = +2) of stock repurchase programs, from the first to the fourth times are 5.82%, 2.09%, 1.86%, and 2.05%, respectively. All of these values are significant at the 10% level. The announcement of stock repurchases sends significantly positive signals to investors. There is no significantly positive signaling effect of stock repurchases after the fifth time a company announces a stock repurchase program. The lower left panel in Table 13 presents the test results of OTC-listed firms; the CAAR of the third and fourth time stock repurchase program are 2.72% and 4.08%, respectively, significant at the 5% level. However, the CAAR (A = -2 to A = +2) of other stock repurchase programs is not statistically significant.

This study compares the differences in CAAR (A = -2 to A = +2) between sequential stock repurchase programs of TSE-listed firms, and presents the results in the final column of the top left panel in Table 13. We expect the CAAR declines

gradually as the times of stock repurchase programs increases. Table 13 indicates that the CAAR (A = -2 to A = +2) values of TSE-listed firms of the first stock repurchase programs are significantly larger than those of the second programs. However, the CAAR differences between other sequential stock repurchase programs are not significantly different. According to these results, it is not possible to obtain consistent support for Hypothesis II from TSE-listed firms. The lower left panel of Table 13 presents the test results of OTC-listed firms. The CAAR values (A = -2 to A = +2) of the fourth stock repurchase program is significantly larger than the fifth program. However, the CAAR differences between other sequential stock repurchase programs are not significantly different. The OTC-listed firms do not provide support for Hypothesis II either.

The top right panel in Table 13 presents the CAAR (A = +3 to E = -3) of TSE-listed firms. The CAAR (A = +3 to E = -3) values of the first to fifth stock repurchase programs are significant at the 1% level. However, the CAAR differences between sequential stock repurchase programs are not significantly different. The lower right panel in Table 13 presents the CAAR (A = +3 to E = -3) of OTC-listed firms. The positive abnormal return does not decrease consistently as the times of stock repurchase programs increases. The additional test results provide no support for Hypothesis II both TSE-listed firms and OTC-listed firms.

Furthermore, this study also uses the sample data from August 9, 2000 through December 31, 2008 to do the additional test of Hypothesis III and IV. However, the untabulated results show that there is no evidence to support for Hypothesis III and IV either.

Table 13
Test for CAAR of Stock Repurchases Based on the Floating Estimation Window

2000/08/09 - 2008/12/31		CAAR (A=-2 to A=+2)			CAAR (A=+3 to E=-3)		
TSE-Listed Firms	Issues	CAAR	t-value	t-value	CAAR	t-value	t-value
1st Time	340	2.5399	5.822***		6.1747	6.807***	
1st and 2nd Test				2.562**			0.175
2nd Time	251	0.9364	2.087**		5.9406	6.101***	
2nd and 3rd Test				-0.071			0.464
3rd Time	178	0.986	1.855*		5.2355	4.500***	
3rd and 4th Test				-0.006			0.973
4th Time	126	0.9906	2.053**		3.5475	2.760***	
4th and 5th Test				0.397			-0.578
5th Time	87	0.6185	0.769		4.6925	3.117***	
5th and 6th Test				0.158			1.068
6th Time	65	0.4505	0.647		2.0937	1.095	
OTC-Listed Firms	Issues	CAAR	t-value	t-value	CAAR	t-value	t-value
1st Time	146	1.0054	1.552		0.9686	0.609	
1st and 2nd Test				0.513			-1.118
2nd Time	79	0.4222	0.452		3.9078	1.866*	
2nd and 3rd Test				-1.522			-0.674
3rd Time	49	2.7247	2.288**		5.9283	2.763***	
3rd and 4th Test				-0.814			0.528
4th Time	31	4.0805	3.503***		3.8546	1.173	
4th and 5th Test				2.095**			-0.894
5th Time	20	-0.738	-0.372		8.8328	1.967*	
5th and 6th Test				-1.425			0.190
6th Time	12	3.0009	1.747		7.6651	1.837*	

Note: There are few companies execute stock repurchases over seven times, so the test results over seven times of stock repurchases is omitted at this table.
*Significant at a 10-percent level, **Significant at a 5-percent level, ***Significant at a 1-percent level.

3.6 Small-Capital Company Effects

The stock prices of small-capital companies should be more volatile than that of large-capital companies, so small-capital companies would have a stronger signaling effect on a stock repurchase program than large-capital companies. Therefore, the CAAR of OTC-listed firms should be larger than that of TSE-listed firms. The former test results provide no consistent support for Hypothesis II, III, and IV. Therefore, this paper divides the sample into two groups by company capital size to analyze whether small-capital company effect exists at Taiwan stock market

or not. Then we test the Hypotheses with sub-sample again.

3.6.1 Testing the Hypotheses with sample period from August 9, 2000 to January 31, 2002

The results in Table 3 show that the capital of OTC-listed firms on average is smaller than that of TSE-listed firms. The average number of outstanding shares in OTC-listed firms is smaller than that in TSE-listed firms. Therefore, OTC-listed firms may more easily influence stock prices when they initiate a stock repurchase program to buy back stocks. This study views OTC-listed companies as small-capital companies and TSE-listed companies as large-capital companies and examines the company-size effect of sequential stock repurchases.

This study uses the fixed estimation method and the floating estimation method to measure the small-capital company effects on stock repurchases. The upper left panel of Table 14 presents the results based on the fixed estimation method over the announcement window. The expected results were not realized, as the CAAR (A = -2 to A = +2) values of TSE-listed firms are significantly larger than those of the OTC-listed firms for the fourth stock repurchase program. The lower left panel in Table 14 presents the results based on the floating estimation method over the announcement window. These test results are similar to those based on the fixed estimation method. The CAAR (A = -2 to A = +2) of TSE-listed firms is significantly larger than that of OTC-listed firms for the fourth stock repurchase program. These results show that the fourth stock repurchase program has a large-capital company effect. However, there is no consistent evidence supporting a small-capital company effect during a sequential stock repurchase programs.

The right panel in Table 14 presents the small-capital company effect for stock repurchases over the execution window. The upper right panel in Table 14 presents the results based on the fixed estimation method. The CAAR (A = +3 to E = -3) values of TSE-listed firms are not significantly different from those of OTC-listed firms, except the fifth stock repurchase program. Furthermore, the lower right panel in Table 14 presents the results based on the floating estimation method. The CAAR (A = +3 to E = -3) values of TSE-listed firms are not significantly different from those of OTC-listed firms for all stock repurchase programs either. There is no significant evidence supporting the small-capital company effect on stock repurchases.

Table 14
Test the Difference of CAAR Between TSE-Listed Firms and OTC-Listed
Firms (2000/08/09 - 2002/1/31)

Fixed Estimation	Announcement Window (A = -2 to A = +2)				Execution Window (A=+3 to E = -3)			
	CAAR-TSE	CAAR-OTC	t-value	P-value	CAAR-TSE	CAAR-OTC	t-value	P-value
1st time	0.0335	0.0451	-0.807*	0.097	0.1218	0.0929	0.961	0.180
2nd time	0.0226	0.0348	-0.885	0.190	0.1114	0.1263	-0.355	0.362
3rd time	0.0226	0.0046	0.935	0.178	0.0691	0.0741	-0.108	0.457
4th time	0.0488	0.0194	1.713**	0.048	0.0973	0.1074	-0.175	0.431
5th time	0.0097	0.0351	-1.165	0.128	0.0732	-0.0176	1.425*	0.087
6th time	0.0201	-0.0045	0.959	0.176	0.0028	0.0803	-1.208	0.129
7th time	0.0216	0.0046	0.597	0.291	0.0197	0.0631	-0.345	0.376
8th time	-0.0258	-0.0126	-0.696	0.279	0.0526	-0.0764	0.447	0.366
9th time	0.0283	-0.0213	-	-	-0.0047	0.4758	-	-
Floating Estimation	CAAR-TSE	CAAR-OTC	t-value	P-value	CAAR-TSE	CAAR-OTC	t-value	P-value
1st time	0.0335	0.0451	-0.807*	0.097	0.1218	0.0929	0.961	0.180
2nd time	0.0178	0.0285	-0.704	0.241	0.1039	0.0562	0.955	0.171
3rd time	0.0090	-0.0017	0.601	0.276	0.0622	0.0170	0.974	0.168
4th time	0.0387	0.0100	1.444*	0.083	0.0739	0.0458	0.471	0.322
5th time	0.0058	0.0248	-0.810	0.214	0.0373	-0.0437	1.244	0.118
6th time	0.0035	0.0006	0.103	0.460	-0.0028	-0.0573	0.523	0.304
7th time	0.0089	-0.0017	0.422	0.348	0.0081	-0.0140	0.254	0.408
8th time	-0.0121	-0.0052	-0.308	0.405	0.0026	-0.0726	0.466	0.361
9th time	0.0289	-0.0141	-	-	-0.0014	0.2833	-	-

*Significant at a 10-percent level, **Significant at a 5-percent level, ***Significant at a 1-percent level.

3.6.2 Testing the Hypotheses with sample period from August 9, 2000 to December 31, 2008

In order to confirm whether our test results of small-capital company effects coming from investor's naïve for stock repurchases or not, we extend our study period from August 9, 2000 to December 31, 2008 and do an additional test based on the floating estimation method.

The AAR and CAAR were computed from samples listed in the TSE and the OTC markets, respectively. Table 15 summarizes the results. The left panel of Table 15 relates to the AAR of TSE-listed and OTC-listed firms. The daily AAR values of TSE-listed firms from A = 0 to A = +2 are 0.34%, 1.95%, and 1.16%, respectively,

significant at 5%. The daily AAR values of OTC-listed from A = 0 to A = +2 are 0.25%, 2.03%, and 0.89%, respectively, significant on A = +1 and A = +2. This shows that there are significantly positive signaling effects over the second half of the announcement window (A = +1 and A = +2). The AAR (A = 0 to A = +2) values of TSE-listed firms are not significantly different from those of OTC-listed firms during all stock repurchase programs.

The CAAR values of TSE-listed firms during the execution window (A = +3 to E = -3) is 6.17%, which is significant at the 1% level. The CAAR values of OTC-listed firms during the execution window (A = +3 to E = -3) is 0.97%, which is not significant at the 10% level. The CAAR (A = +3 to E = -3) values of TSE-listed firms are significantly larger than those of OTC-listed firms during all stock repurchase programs. There is no significant evidence supporting the small-capital company effect on stock repurchases with extended data.

Table 15
TSE-Listed and OTC-Listed Firms' AAR and CAAR during Stock Repurchase Programs
(2000/08/09 - 2008/12/31)

Date	Issues of TSE-Listed Firms (n=1243)		Issues of OTC-Listed Firms (n=368)		AAR Difference Between TSE and OTC	Issues of TSE-Listed Firms (n=1243)		Issues of OTC-Listed Firms (n=368)		CAAR Difference Between TSE and OTC
	AAR	t-value	AAR	t-value	t-value	CAAR	t-value	CAAR	t-value	t-value
A-10 ~ A-3	-	-	-	-	-	-3.7040	-7.998***	-3.2915	-3.928***	-0.430
A-2	-0.4431	-2.828***	-1.3694	-5.909 ***	3.311***	-0.4431	-2.828***	-1.3694	-5.909***	3.311***
A-1	-0.4666	-2.827***	-0.7894	-3.101***	1.064	-0.9096	-3.512***	-2.1589	-5.452***	2.640***
A-0	0.3392	2.032**	0.2484	1.024	0.308	-0.5704	-1.661*	-1.9104	-3.909***	2.243**
A+1	1.9511	11.459***	2.0276	7.580 ***	-0.241	1.3806	3.436***	0.1171	0.196	1.759*
A+2	1.1593	7.290***	0.8883	3.675 ***	0.936	2.5399	5.822***	1.0054	1.552	1.964*
A+3 ~ E-3	-	-	-	-	-	6.1747	6.807***	0.9686	0.609	2.845***
E-2	0.0916	0.643	0.0955	0.446	-0.014	0.0916	0.643	0.0955	0.446	-0.014
E-1	-0.0897	-0.653	0.3804	1.636	-1.741*	0.0019	0.008	0.4759	1.365	-1.158
E-0	0.2519	1.806*	-0.087	-0.361	1.218	0.2538	0.942	0.3889	0.861	-0.256
E+1	-0.4177	-2.917***	-0.4224	-1.723*	0.016	-0.1639	-0.541	-0.0335	-0.064	-0.217
E+2	-0.0665	-0.440	0.0207	0.090	-0.318	-0.2304	-0.684	-0.0128	-0.021	-0.317

*Significant at a 10-percent level, **Significant at a 5-percent level, ***Significant at a 1-percent level.

4. Conclusion

Relatively few companies execute sequential stock repurchase programs outside of Taiwan. Sequential stock repurchase programs result from a special stock repurchase regulatory environment. This study is the first to review the signaling effects of sequential stock repurchases. Previous research (Mitchell, 1989; Comment and Jarrell, 1991; Ikenberry et al., 1995; Raad and Wu, 1995; Liu and Ziebart, 1997; Tsai and Guo, 2004; Liu and Chen, 2010) suggests that stock repurchases send positive signal to the market that stock prices were undervalued, while sequential stock repurchases sometimes send no significant signals to the market. However, this does not mean that the stock market is inefficient. On the contrary, the stock market learns quickly from a firm's sequential announcements of stock repurchase programs. This study treats stock repurchase program announcements as signals and examines the signaling effects among sequential stock repurchase programs. The signal effects of stock repurchases depend on their announcement and execution. The major findings of this study are summarized as follows.

This study uses an event study methodology to investigate the signaling effects of sequential stock repurchase programs in Taiwan. The announcement of the first stock repurchase program creates a significantly positive CAAR (A = -2 to A = +2) for stockholders over the announcement window. This finding agrees with previous studies (Ikenberry et al., 1995; Raad and Wu, 1995). However, as the number of stock repurchase program increases, the strength of signaling effect over the announcement window decreases gradually. Furthermore, after the first stock repurchase program is executed, the stockholders experience a significantly positive CAAR (A = +2 to E = -2) over the execution window. If the times of stock repurchase programs increases, the signaling effect over the execution window decreases. However, when a stock repurchase program is executed more than three times, there is no consistent evidence supporting the signaling effect over the announcement and execution windows. Brockman and Chung (2001) found that the managers of SEHK-listed firms possess valuable timing abilities for stock repurchase programs. The TSE-listed and the OTC-listed firms in this study have timing abilities for stock repurchase programs that are found at the first and the second announcement of a program, but not after the third program.

The stock prices of small-capital companies should be more volatile than that of large-capital companies, so small-capital companies would have a stronger signaling effect on a stock repurchase program than large-capital companies. Therefore, the CAAR of OTC-listed firms should be larger than that of TSE-listed firms. Comparing the signaling effect between the TSE-listed firms and the OTC-listed firms provides no evidence supporting a small-capital company effect related to stock repurchases.

Finally, this study examines the relationship between the number of stock repurchase programs and the completion rate (the ratio of the *number of actual stock repurchase number of targeted stock repurchase*). Based on the capital weighted average method, the completion rate of the non-continuous stock repurchase group is higher than that of the continuous stock repurchase group during the first, second, and fourth stock repurchase programs for TSE-listed firms. However, there is no significant evidence supporting this hypothesis for other stock repurchase programs by TSE-listed firms. Furthermore, there is no evidence supporting this hypothesis for any stock repurchase programs announced by OTC-listed firms.

According to the Stock Exchange Law in Taiwan, if a company announces a plan to launch a stock repurchase program, the program must be completed within two months after the announcement. Therefore, the long-term effects cannot be identified for stock repurchases that are founded in other markets (Lakonishok and Vermaelen, 1990; Ikenberry, et al., 1995). Instead of discussing the long-term effects of stock repurchases, this study focuses on the effect of sequential stock repurchase programs. The results of this study imply that sequential stock repurchase programs cannot continuously send positive signals to the stock market. On the other hand, the practice of sequential stock repurchases creates "noise" in the stock market. If the managers of listed firms attempt to use the announcement of sequential stock repurchase programs to manipulate stock prices, they may produce the opposite result. In addition, listed companies can repurchase common stocks for three different reasons in Taiwan. There are different rationales for why a company buys back stocks, and these reasons could send different signals to the market. This study does not investigate the relationship between the signaling effect and the rationale for why a company buys back stocks. Thus, the analysis of the relationship between the signaling effect and the rationale behind stock repurchase remains an

interesting topic for future research.

This study discusses the signaling effects of sequential stock repurchases after the stock repurchase system was introduced in August 2000, in which the listed companies and investors were not familiar with stock repurchases. Today, listed companies and investors have more knowledge and experience with stock repurchases than they had in 2000. The signaling effects of stock repurchases could differ between a naive market and a mature market. Future research should explore a sophisticated investor's responses for sequential stock repurchases.

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