CAN THE OPEN MARKET REACT TO STOCK REPURCHASES ANNOUNCEMENT CORRECTLY?

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ABSTRACT

In this study, we explore the market reaction to the announcement of stock repurchase plans, and the mutual influence between the actual fulfillment rate of stock repurchase plans and the degree of earnings management. From the perspective of earnings management behavior, this paper also analyzes the actual fulfillment rate, and discusses the information asymmetry, firms may carry out earnings management before stock repurchases, to mislead the investors into believing the prettified financial statements, to induce the investors to invest, and convey false signals to the market. The empirical results demonstrate that the cumulative abnormal return (CAR) resulting from true signals is higher than that resulting from false signals. Further, the phenomenon is more significant in the hi-tech industry than in traditional industries, and the firms with Purpose 3(support the stock prices to maintain firm credit and shareholders' equity), a significant, positive abnormal return is observed on the day before and the day after the announcement day. In bullish periods, abnormal returns are not significant; in bearish periods, a significant, positive abnormal return is observed. These findings are applicable not only to the research samples but also to the samples when the extreme values are removed. Therefore, the empirical results are still robust.

JEL: G32, G34, G41

KEYWORDS: Stock Repurchases, Abnormal Returns, Earnings Management

INTRODUCTION

On October 19th, 1987, the Dow Jones Industrial Average (DJIA) index experienced a sharp drop within six hours, with an estimated loss of 22% of the market value of stocks. In the subsequent several days, at least 900 publicly listed firms announced their stock repurchase plans (Kracher et al., 1997). As a result, the situation was reversed within a short period. The stock market embraced the quick rebound, and the DJIA index regained a bullish trend. Due to this event, the treasury stock system rose to fame. In 2000, Taiwan revised the related law to adopt the treasury stock system, thus providing a legal basis for the suspended treasury stock system. Specifically, the treasury stock system granted publicly listed firms the permission to repurchase their stocks in the public stock market. From then on, the treasury stock system has become a hot issue of research. This study explores the market reaction to the announcement of stock repurchase plans, and the mutual influence between actual fulfillment rate and earnings management. In light of the signal hypothesis, this paper also discusses whether the cumulative abnormal return (*CAR*) arising from the true signals is higher than the *CAR* arising from the false ones. Previous studies show that the announcement of stock repurchase plans will result in a positive abnormal return. There exist diverse views in the previous literature regarding this return. In the general literature, there exist a variety of hypotheses regarding the purposes of stock repurchases. For example, improving the return on equity, distributing the surplus capital, forestalling hostile takeover, adjusting the leverage ratio to the desired level, attaining managerial entrenchment, substituting the payment of cash dividends, depriving the creditors of their wealth, and conveying specific signals.

Signals, conveying certain signals is considered as the main motive of the announcement of stock repurchases. As set forth in the early literature, the announcement of stock repurchase plans will result in a positive abnormal return, indicating that the firms' stock prices are underestimated (Vermaelen, 1981; Netter and Mitchell, 1989; Comment and Jarrell, 1991; Raad and Wu, 1995; Ikenberry, Lakonishok and Vermaelen, 1995; Liu and Ziebart, 1997; Nohel and Tarhan, 1998; Dittmar, 2000). In case the firms' stock prices have a great slump but are unlikely to rally subsequently, however, the firms may actively implement stock repurchase plans by spreading false information, to boost their stock prices. Sometimes, investors are misled in stock markets, or specifically, firms announce their stock repurchase plans in public but in essence, carry out earnings management. Therefore, investors must give careful consideration when making decisions, and observe whether firms intend to cover up their earnings management decisions by announcing stock repurchase plans. Therefore, investors should stay away from firms with high discretionary accruals when they make decisions.

Oriented toward the announcement of stock repurchase plans by firms, this study distinguishes the degree of their earnings management before their announcement of stock repurchases, analyzes the actual stock repurchase rate, and thus discusses whether the abnormal return is different between the firms with a varying degree of earnings management. Further, this study analyzes whether the *CAR* of firms with a high degree of earnings management is different from that of firms with a low degree of earnings management, and judges, whether the signals conveyed by the firms,a are true or false. According to the observation of all samples, when firms carry out negative earnings management on the announcement day, a positive and significant abnormal return is produced. Evidently, the market reaction to the true signals is more significant than that of the false signals if firms carry out negative earnings management before the announcement of stock repurchase plans. In the circumstances where firms convey true signals (earnings management is of low degree and negative, and the actual stock repurchase rate is very high), the market reaction to the true signals is not more significant than that of the false signals (specifically, earnings management is of high degree and positive, and the actual stock repurchase rate is very low). In other words, this effect has not been observed. In the circumstances where firms convey true signals (earnings management is of low degree and positive, and the actual stock repurchase rate is very high), the market reaction to true signals is a little more significant than that of the false signals (specifically, earnings management is of high degree and negative, and the actual stock repurchase rate is very low). When earnings management is positive, the market reaction to the true signals is not more significant than that of the false signals. Judging by the absolute values of earnings management, the market reaction to the true signals, represented by a low degree of earnings management and high actual fulfillment rate, is not more significant than that of the false signals, represented by a high degree of earnings management and low actual stock repurchase rate.

Furthermore, this study explores in depth whether the market reaction to the true signals is more significant than that of the false signals in different circumstances. In the case where the entire sample is used, the market reaction to the true signals is more significant than that of the false signals. After the top 1% and bottom 1% extreme values are removed from the sample, the market reaction to the true signals is more significant than that of the false signals. Besides, the present study finds that in bullish periods, the market reaction to the true signals is not more significant than that of the false signals, whereas in bearish periods, the market reaction to the true signals is more significant than that of the false signals. For hi-tech firms, the market reaction to the true signals is more significant than that of the false signals; for traditional firms, the market reaction to the true signals is also more significant than that of the false signals. Firms repurchase their stocks outstanding for three purposes. Specifically, Purpose 1 is to transfer shares to their employees; Purpose 2 is to facilitate the issue of warrant bonds, preferred shares with warrants, convertible bonds, convertible preferred stocks, or stock warrants, thus satisfying the need to transfer shares; Purpose 3 is to maintain firm credit and shareholders' equity, and cancel the related shares.

Purpose 2 only involves 6 observations, so this study only uses Purposes 1 and 3 for sample classification. For the firms with Purpose 1, the market reaction to true signals is not more significant than that to false signals; for the firms with Purpose 3, the market reaction to true signals is more significant than that to

false signals. Therefore, the present study finds that the market reaction to true signals is more significant than that to false signals. This paper comprises a total of five sections. Section 1, describes the motives and purposes of the present study. Section 2, gives a review of the previous literature on market reaction to stock repurchases and announcement of stock repurchases, stock price reactions to actual fulfillment rate and announcement of stock repurchases, investment signals conveyed by stock repurchases, and earnings management. Section 3, describes the research hypotheses, regression model and methodology. Section 4, analyzes empirical results and discussion. Section 5, summarizes the study conclusions, and points out the limitations of this study and the suggestions for futher research.

LITERATURE REVIEW

Oriented to the firms that announce stock repurchase plans, the present study is intended to analyze whether such firms have any signs of earnings manipulation, and discuss the correlation between actual stock repurchase rate, earnings management, and abnormal returns.

The Motivation and Purposes of Share Repurchases

Regarding the motives and purposes of stock repurchases, there mainly exist the following views in the early research literature: 1) Firms may improve the return on equity; when the financing costs of debts are low and corporate operating profits are high, firms can repurchase their stocks for use as treasury stocks through debt finance; this results in a decrease in shareholders' equity and an increase in the return on equity. 2) Firms may return capital to the shareholders through stock repurchases instead of the payment of cash dividends; this results in a reduction in the shareholders' tax burden without any dilution of value per-share, and also an adjustment of capital structure (Dittmar, 2000; Grullon and Ikenberry, 2000). 3) Firms prefer to return the surplus capital to the investors by implementing stock repurchase plans, to maintain the value of stock options held by them and prevent the earnings per share from being diluted by the stock options (Dittmar, 2000). 4) Firms may convey the signals of their promising prospect and future cash flows (Vermaelen, 1981). 5) Firms may carry out managerial entrenchment and suppress free cash flows, to reduce the principal-agent problems (Jensen, 1986; Grullon and Ikenberry, 2000).

The Market Reaction to the Announcement of Stock Repurchase Plans and Earnings Management

The market reaction to the announcement of stock repurchases is mainly influenced by the insider ownership ratio, purposes of stock repurchases, and book-to-market ratio. According to the research on the long-term performance of an announcement of stock repurchases in open markets, Ikenberry, Lakonishok, and Vermaelen (1995) find that firms choose to repurchase their stocks because they consider their stocks undervalued by markets, and after the announcement of stock repurchases, their stock prices are influenced positively, and a significant abnormal return is produced. In their research, firms are classified by the book-to-market ratio. The research results show that the firms with a high book-to-market ratio are undervalued the most significantly; in other words, a significant abnormal return is produced when the firms with value-oriented stocks announce their stock repurchase plans. According to the empirical results, the following can be inferred: The firms with a high book-to-market ratio are very likely to convince the markets that their stock prices are underestimated; when such firms announce their stock repurchase plans, the investors are likely to believe the firm managers' statements, thus purchasing their stocks. Chou and Lin (2003) study the possibility that false signals are conveyed when firms announce their stock repurchase plans in open markets. Research results show that external professionals do not regard stock repurchases as a piece of good news; firm managers can manipulate financial statements to improve the earnings performance and adjust the discretionary accruals to convince outsiders that the firm equity is undervalued. Research results also show that stock analysts do not regard the announcement of stock repurchases as a positive signal, so they give a downward rather than upward revision of the earnings forecast. Also, small negative surprise revisions are found in the earnings forecasts of the stock analysts. In other words, firms may convey false information to market participants by repurchasing their stocks in open markets, to emphasizing that their firm equity is underestimated.

Chou and Lin (2003) discuss the false signals conveyed by the announcement of stock repurchases and conduct empirical research from the perspective of earnings management and analysts' revisions of financial forecasts. Research results show that firms will resort to the weakest signal mechanism, namely, repurchase their stocks in an open market to convey false information to market, to emphasizing that their firm equity is undervalued. However, does the announcement of stock repurchases by firms only convey false signals? This study aims to determine the actual fulfillment rate after the announcement of stock repurchases. Therefore, this study uses the actual fulfillment rate to verify whether firms have really fulfilled their stock repurchase plans, and explores the following two issues: 1) whether the firms announcing stock repurchase plans display any behavior of manipulating the earnings management, and 2) whether the cumulative abnormal return (*CAR*) of the firms conveying true signals is significantly higher than the *CAR* of the firms conveying false signals. Therefore, in the case of information asymmetry, firms may carry out earnings management before stock repurchases, to mislead the investors into believing the prettified financial statements, induce the investors to invest, and convey false signals to the market.

If investors have rational expectations and the actual fulfillment rate is very high, this indicates that the firms are indeed releasing positive information to boost their underestimated stock prices; then, their stock prices will produce an abnormal return (Stephens and Weisbach, 1998). As compared to the firms that have not fulfilled their stock repurchase plans substantially, the stock prices of firms with an actual fulfillment rate of 30% or above will produce a significant and positive abnormal return in the long term (Ikenberry, Lakonishok, and Vermaelen, 2000). Firms may have fulfilled their stock repurchase plans, but the actual number of repurchased stocks is smaller than the announced number of stocks to be repurchased; this is mainly due to the rise in stock prices, thus making stock repurchases less attractive than expected; however, the actual number of repurchased stocks will increase in the case of a fall in stock prices (Baker et al., 2003). This type of stock transactions is consistent with the signal hypothesis. Therefore, an investment portfolio with a high actual fulfillment rate reacts to the conveyed information ahead of the investment portfolio with a low actual fulfillment rate. This implies that the actual fulfillment rate of stocks used as treasury stocks will influence the degree of investors' attention.

The Influence on Stock Prices Exerted by the Stock Repurchase Plans and Earnings Management

Regarding the influence on stock prices exerted by the announcement of stock repurchase plans by firms, there exists a high degree of consensus in the previous research literature. Specifically, upon the announcement of stock repurchase plans by firms, their stock prices will embrace an immediate short-term rise; this indeed represents a piece of good news to the investors. The extent of the rise in stock prices may be influenced significantly by a variety of variables. For the firms listed in NYSE, the *CAR* arising from the announcement of stock repurchase plans has a significantly positive correlation with the market value of treasury stocks (Tsetsekos, 1993), announced repurchase rate (Raad and Wu 1995; Liu and Ziebart, 1997), operating revenue (Bartov, 1991; Dann et al. 1991; Tsetsekos, 1993), benefit-cost ratio (Rozeff and Zaman, 1988), and shareholding ratio by internal shareholders (Penman, 1982; Netter and Mitchell 1989; Raad and Wu 1995). In contrast, the *CAR* arising from the announcement of stock repurchase plans has a significant negative correlation with the risk or Beta value (Dann et al., 1991; Bartov, 1991; Tsetsekos, 1993; Choi and Chen, 1997), debt ratio (Wansley et al., 1989; Bartov, 1991; Tsetsekos, 1993), firm size (Rozeff and Zaman, 1988, Tsetsekos 1993; Liu and Ziebart, 1997), and bid-ask spread (Wiggins, 1994). Fama (1970) argues that a market is efficient if security prices fully reflect the available information in the market. At this time, investors cannot capitalize on any trading strategy to earn an excess return. Research results show that a significant and positive abnormal return is produced before and after firms announce their stock repurchase plans (Vermaelen, 1981; Netter and Mitchell, 1989; Comment and Jarrell, 1991; Raad and Wu, 1995; Ikenberry, Lakonishok, and Vermaelen, 1995; Liu and Ziebart, 1997; Nohel and Tarhan, 1998; Dittmar, 2000).

This paper discusses whether the stock prices of firms produce a significant abnormal return before and after the firms announce their stock repurchase plans. Bhattacharya (1979), Miller and Rock (1985), and Vermaelen (1984) argue that there exists an information asymmetry between firm managers and investors.

Firm managers know more about the firm's prospects and real firm value than the outside investors, so firm managers can repurchase stocks in an open market to convey the promising prospects to the markets, thus leading market to purchase their stocks; when firms carry out stock repurchase plans, market investors will reevaluate the firms, thus resulting in positive market reaction toward the firms' future performance. After firms announce their stock repurchase plans, their stock prices will produce a significant and positive abnormal return; therefore, it is inferred that investors may regard the announcement of stock repurchases as a signal of promising firm prospect, and believe that the firms' value is underestimated (Vermaelen, 1981; Dann, 1981; Dittmar, 2000). Empirical results show that the stock prices of firms may experience an abnormal drop in market crash periods before the announcement of stock repurchases and rebound in a certain period after the announcement of stock repurchases (Netter and Mitchell, 1989). The research results demonstrate that the announcement of stock repurchase plans exerts a positive influence on stock markets. In other words, the announcement of stock repurchases is regarded as a signal that the insiders of firms consider their stock prices to be underestimated. Previous literature mostly focuses on the market reaction (for example, abnormal return from stock prices and earnings management) to the announcement of stock repurchase plans, but rarely touches on the market reaction to the true or false signals conveyed by the announcement of stock repurchases. Because of this, this paper gives a further discussion of this topic.

RESEARCH HYPOTHESIS AND METHODOLOGY

Research Hypothesis

By announcing their stock repurchase plans, firms may convey two types of signals to markets: 1) true signals (firm value is underestimated), which will lead the markets to revalue their stocks; 2) false signals (firm managers announce stock repurchase plans for their own benefits, but the stock repurchase plans are not necessarily fulfilled), which may misadvise the investment decisions of the investors. Because of this, it is of vital importance to distinguish the true from the false signals conveyed by the announcement of stock repurchase plans; the investors need to have great ability to discriminate true signals from false ones. This paper discusses whether true or false signals are conveyed to the markets when firms announce their stock repurchase plans. When the degree of earnings management is above the average level, and the actual stock repurchase rate is above the average level, this indicates that true signals are conveyed to the market. When the degree of earnings management is above the average level while the actual stock repurchase rate is below the average level, this indicates that false signals are conveyed to the market.

Ikenberry et al. (1995) argue that there exists a market under-reaction to open market share repurchases. However, firm managers convey false signals to markets if firm equity is not undervalued, namely, there exists any market under-reaction to the announcement of stock repurchase plans. This paper assumes that firm managers will manipulate an upward revision of discretionary accruals to cover up the fact of no undervaluation, thus convincing the investors that firm equity is underestimated. The efficient market hypothesis is discussed in this paper: If all investors are rational and acquire the ability to analyze financial reports, firm managers will decrease the manipulations of earnings management to win the investors' trust; then, firm managers will try to convey signals that various types of information are reflected in stock prices effectively. Using event study methodology, this study checks how new information is incorporated into stock prices; the intent is to evaluate whether the abnormal return of firms with a below-average degree of earnings management and an above-average actual fulfillment rate is higher than the abnormal return of firms with earnings management behaviors and a low actual fulfillment rate. Therefore, this paper proposes the following hypothesis:

Hypothesis When firms announce their stock repurchase plans, the cumulative abnormal return (*CAR*) arising from the true signals is higher than that arising from the false signals.

Empirical Regression Model

This paper discusses whether the earnings management behaviors of firms will influence their announcement of stock repurchase plans. The market reaction (represented by an abnormal return) to the announcement of stock repurchase plans varies with the degree of earnings management and actual fulfillment rate. Therefore, this paper introduces a dummy variable representing true or false signals to discuss the influence on abnormal returns exerted by the announcement of stock repurchase plans. The main regression model is expressed as follows:

$$CAR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t}$$

$$+ \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t} \tag{1}$$

Where, $CAR(\tau_1, \tau_2)$ indicates the cumulative abnormal return (CAR) in the event window(τ_1, τ_2) regarding the i-th stock to be repurchased. $SIGNAL_{i,t}$ is the dummy variable representing true or false signals. $SIZE_{i,t}$ indicates the firm size (the natural logarithm of the market value of firm equity). $BM_{i,t}$ indicates the book-to-market ratio. $IOR_{i,t}$ indicates the insider ownership ratio. $IPR_{i,t}$ indicates the insider pledge ratio. $GRW_{i,t}$ indicates the sales growth rate. $CAP_{i,t}$ indicates the capital expenditure ratio. $DER_{i,t}$ indicates the ratio of debt to equity. $CDY_{i,t}$ indicates the cash dividend yield. $DevA_{i,t}$ indicates the deviation between voting rights and cash distribution right, and $DevB_{i,t}$ indicates the deviation between director right and cash distribution right. Table 1 shows the definition of variables.

Research Sample and Data

From the perspective of earnings management behaviors, this study investigates 664 of Taiwan's publicly listed firms that announced stock repurchase plans during the period of Quarter 3 of 2008 to Quarter 2 of 2016. The criteria for sample selection are as follows: 1) The selected sample excludes the firms that announce stock repurchase plans repeatedly in the same year, but only includes the firms that announce stock repurchase plans for the first time, thus preventing biased errors in the research results. 2) The stocks available from the TEJ (Taiwan Economic Journal) with data omissions are excluded. 3) Full-cash delivery stocks are excluded; certain stocks are not full-cash delivery stocks when they are repurchased for use as treasury stocks, but are categorized as full-cash delivery stocks subsequently. To prevent the abnormal fluctuation in stock prices due to the changes in stock categorization and trading methods, full-cash delivery stocks are excluded; the quantity and transaction amount of full-cash delivery stocks account for a small proportion of all traded stocks, so they do not produce a significant influence. 4) Due to the special nature of the banking and securities industry, the firms in this industry are excluded. 5) The other industries that possess unique industrial characteristics or comprise very few firms are also excluded. 6) For a few industries, the number of observed values is not sufficient, thus affecting the reliability of the regression estimation. Therefore, such industries are consolidated to satisfy the needs of estimation of non-discretionary accruals. The financial data of the sampled firms are available from the TEJ database. The data about the conditions for stock repurchases is available from the Market Observation Post System of the Taiwan Stock Exchange. Using the method proposed by Kothari et al. (2005), Table 2 shows the consolidated industries, to introduce the cross-section data about the industries of same categories in the same year to the regression model, to estimate the discretionary accruals. However, a few Taiwanese industries comprise very few firms; therefore, the related industries are consolidated to overcome the insufficiency in the number of observed values.

Table 1: Definition of Variables

Variable Category	Definition of Variable
Dependent Variable	CAR(Cumulative Abnormal Return) $AR_{i,t} = R_{i,t} - E(\widehat{R_{i,t}})$, the $i-$th stock to be repurchased, abnormal returns (2) $CAR_i = \sum AR_{i,t}$, the $i-$th stock to be repurchased, cumulative abnormal returns (3)
Independent Variables	a) DA(Discretionary Accruals): using the methods proposed by Kothari, Leone, and Wasley (2005) and set forth in most of the research literature, this study uses DA (discretionary accruals) as the proxy variable to measure the degree of accrual earnings management, and measure the space of the administering authority's earnings management allowed by certified accountants (DeFond and Jiambalvo, 1994; Jones, 1991; Becker, DeFond, Jiambalvo, and Subramanyam, 1998; Subramanyam, 1996; Francis and Schipper, 1999). Using the method proposed by Kothari et al. (2005), this study introduces the cross-sectional data regarding the industries of the same category and year into the regression model, to estimate $DA_{i,t}$. The measurement method is expressed as follows: $$\frac{TA_{i,t}}{A_{i,t-1}} = \delta_0 + \delta_1 \left[\frac{1}{A_{i,t-1}}\right] + \delta_2 \left[\frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{A_{i,t-1}}\right] + \delta_3 \left[\frac{PPE_{i,t}}{A_{i,t-1}}\right] + \delta_4 ROA_{i,t-1} + \varepsilon_{i,t} \quad (4)$$ Where, $TA_{i,t}$ indicates the total accruals, which are equal to the pretax earnings of the continuous operating activities minus the cash flow from operating activities. $A_{i,t-1}$ indicates the total assets in early stage. ΔREV indicates the changes in sales revenue. ΔREC indicates the changes in accounts receivable. PPE indicates the total depreciable fixed assets (including housing and buildings, costs of machines, instruments and devices, costs of other devices, value added from revaluation of fixed assets, and value added from land revaluation), and $ROA_{i,t-1}$ indicates the return on total assets in early stage, and $\varepsilon_{i,t}$ indicates the residual term. $$\frac{NDA_{i,t}}{A_{i,t-1}} = \hat{\delta}_0 + \hat{\delta}_1 \left[\frac{1}{A_{i,t-1}}\right] + \hat{\delta}_2 \left[\frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{A_{i,t-1}}\right] + \hat{\delta}_3 \left[\frac{PPE_{i,t}}{A_{i,t-1}}\right] + \hat{\delta}_4 ROA_{i,t-1} \quad (5)$$ $$\frac{DA_{i,t}}{A_{i,t-1}} = \frac{TA_{i,t}}{A_{i,t-1}} - \frac{NDA_{i,t}}{A_{i,t-1}} \quad (6)$$ Where $NDA_{i,t}$ indicates the non-discretionary accruals. Finally, $DA_{i,t}$ can be determined as the difference between actual total accruals $(TA_{i,t})$ and estimated non-discretionary accruals $(NDA_{i,t})$ b) $SIGNAL$ is a dummy variable, it indicates whether the conveyed signals are true or false. The actual fulfillment rate and discretionary accruals $(DA_{i,t})$ are used as the criteria for judging true or false signals. A high actual fulfillment rate and low discretionary accruals indicate that true signals are conveyed to market; a low actual fulfillment rate and high discretionary accruals indicate that false signals are conveyed to market. $SIGNAL$ indicates true signals if its value is 1, and false signals if its value is 0. It cannot be judged whether true or false signals are conveyed in the following two circumstances: 1) The degree of earnings management and actual fulfillment rate are both above their average levels. 2) The degree of earnings management and actual fulfillment rate are both below their average levels. Therefore, observations that fit these two circumstances are excluded from this study. c) Actual Repurchase Rate: this paper uses the data available from the Market Observation Post System. The actual fulfillment rate is equal to the ratio of the current number of repurchased stocks to the predetermined number of repurchased stocks, and the actual repurchase rate is averaged among all the observations, for use as the criterion for judging the final actual fulfillment rate. If firm size and book-to-market ratio are held constant, the announcement of stock repurchase plans will result in an excess return in the long term; this is mainly due to discretionary accruals (Ikenberry et al., 1995).
Firm Characteristic Variables	a) $SIZE$ (Firm Size) = The natural logarithm of the market value of firm equity = $ln(Size)$ b) BM (Book-to-Market Ratio) = The ratio of equity net worth to equity market value
Insider Trading Variables	a) Insider Ownership Ratio (IOR) = (Number of stocks held by insiders) ÷ (Number of outstanding stocks) b) Insider Equity Pledge Ratio (IPR) = (Number of stocks pledged by insiders) ÷ (Number of stocks held by insiders)
Accounting Information Variables	a) GRW (Revenue Growth Rate) = (Net operating revenue of the year) ÷ (Net operating revenue of the second year) − 1 b) CAP (Expense to Capital Ratio) = (Average annual expense in the previous two years) ÷ (Market value of firm equity in the previous one year) c) Debt to Equity Ratio (DER) = (Total debt) ÷ (Market value of equity) d) Cash Dividend Yield (CDY) = (Cash dividends) ÷ (Market value of equity)
Corporate Governance Variables	a) $DevA$ (Deviation between voting right and cash distribution right) = (Control voting right ratio) − (Cash distribution right) b) $DevB$ (Deviation between director seat right and cash distribution right) = (Control director seat right ratio) − (Cash distribution right)

This table shows the definition of variable

Table 2：Categories of Consolidated Industries

Category of Consolidated Industries	Industry Categories in Taiwan Stock Exchange
Construction & Building Materials	Cement Industry, Iron & Steel Industry, Building Materials & Construction
Food & Department Store	Food Industry, Department Store Industry
Plastics & Chemicals	Plastics Industry, Chemical, Biotech & Pharmacy Industry, Rubber Industry
Textiles	Textile Fiber Industry
Electro-Mechanics	Electro-Mechanics Industry, Electrical Appliance & Cable Industry
Electronics	Electronics Industry (excluded TDR)

This table using the method proposed by Kothari et al. (2005), this study introduces the cross-section data on the industries of same categories in the year for the regression model, to estimate the discretionary accruals. However, a few industries of Taiwan each comprise very few firms; therefore, the related industries are consolidated to overcome the insufficiency in the number of observed values.

Table 3 lists the number of observations in each industry, total number of observations, and statistics based on the purposes of stock repurchases.

Descriptive Statistical Analysis

As described in Table 4, it shows that the firms have a slightly negative average *CAR* before they carry out stock repurchase plans, and have a positive average *CAR* during the period of fulfilling the stock repurchase plans, among the total 664 observations, the average *CAR* is 0.19 on the announcement day (*CAR*(0, 0)), and is 1.48 from the day before the announcement day to the day after the announcement day (*CAR*(-1, 1)). Evidently, their underestimated stock prices rise gradually. This proves that the fulfillment of stock repurchase plans indeed serves to boost the underestimated stock prices.

Table 3: Statistics of Share Repurchases

Total number of eligible firms in the related industries	287 firms
Total number of observations of share repurchases	664 events
Number of Observations in Each Industry (in Descending Order)	
Electronics Industry (excluding TDR)	189 firms
Textile Fiber Industry	21 firms
Building Materials & Construction Industry	15 firms
Iron & Steel Industry	13 firms
Chemical, Biotech & Pharmacy Industry	13 firms
Electro-Mechanics Industry	12 firms
Trade & Department Store Industry	8 firms
Electrical Appliance & Cable Industry	5 firms
Plastics Industry	4 firms
Cement Industry	3 firms
Rubber Industry	3 firms
Food Industry	1 firm
Statistics Based on the Purposes of Stock Repurchases	
Purpose 1: Transfer shares to employees	322 observations
Purpose 2: Transfer of shareowners	6 observations
Purpose 3: Maintain firm credit and shareholders' equity	336 observations
Number of firms with expiration, completion, or termination of stock repurchase plans	664 firms

The research period is from Q3 of 2008 to Q2 of 2016, and the financial data of the sampled firms are available from the TEJ database. The data about the conditions for stock repurchases are available from the Market Observation Post System of Taiwan Stock Exchange.

EMPIRICAL RESULTS AND DISCUSSION

Based on the research hypothesis and methodology in previous section, this section gives an empirical analysis and makes an inference from the empirical results. Section 1 conducts a statistical analysis for the degree of earnings management made by the firms announcing their stock repurchase plans and describes the distribution of the observations in the related industries. Section 2 verifies the short-term effect of the announcement of stock repurchase plans according to the degree of earnings management. Section 3 conducts a regression analysis.

Sample Structure of Share Repurchases Announced

The research sample consists of Taiwanese publicly listed firms that announced their stock repurchase plans in Taiwan's open stock market. Through sample screening, there are 287 eligible firms. Among these, there are 31 firms in the construction & building materials industry (accounting for 10.8% of the total), and 9 firms in the food & department store industry (accounting for 3%). There are 20 firms in the plastics & chemicals industry (accounting for 7%), and 21 firms in the textile industry (accounting for 7.3%). There are 17 firms in the electromechanical industry (accounting for 6%), and 189 firms in the electronics industry (accounting for 65.9%, the highest proportion).

Descriptive Statistics on Discretionary Accruals (*DA*)

Using the method proposed by Kothari et al. (2005), Table 4 lists the results of the descriptive statistical analysis, to introduce cross-sectional data on the industries of the same categories and year to the regression model, to estimate the discretionary accruals. The sampled firms that manipulate earnings management before the announcement of stock repurchase plans can be divided into two types: 1) firms with positive discretionary accruals, and 2) firms with negative discretionary accruals. Table 5 describes the distribution of the sampled firms in the different industries. Among the 664 sampled firms, there are 308 sampled firms with positive earnings management before stock repurchases and 356 sampled firms with negative earnings management before stock repurchases.

Effect of the Announcement of Stock Repurchase Plans

The setting of time parameters   Using the market model of event study methodology, this study measures the abnormal return after stock repurchases and distinguishes the sampled firms into two types, one with positive discretionary accrual and another one with negative discretionary accrual. Then, this study observes the *CAR* of the two types of firms after the announcement of stock repurchase plans. The related time parameters are defined as follows: 1) Event day: The day on which firms announce their stock repurchase plans (t = 0). 2) Estimation period: A total of 121 days, starting from the 150th day before the event day to the 30th day before the event day (t = –150 to –30). 3)Event window: A total of 7 days, starting from the 1st day before the event day to the 5th day after the event day (t = –1 to +5).

Difference in the Effect of the Announcement of Stock Repurchase Plans

In the present study, the *CAR* on the event day is displayed through an event window. Tables 6 and 7 describe the analysis results on the earnings management behavior before the announcement of stock repurchase plans. In Table 6, Panel A lists the absolute values of earnings management regarding 664 firms that announced stock repurchase plans. Among the 664 firms, 227 firms convey true signals and 118 firms convey false signals. During the period from the day before the event day to the day after the event day (the event window is (-1, +1)), the abnormal return of the firms with a high degree of earnings management and high actual fulfillment rate is higher than the abnormal return of the firms with a high degree of earnings management and low actual fulfillment rate. The result of a t-test indicates statistical significance at the 10% level. It shows that the market reaction to the true signals is more significant than

that of the false signals. In Table 6, Panel B lists the data on the upward revision of the earnings forecast regarding the 664 firms that announced stock repurchase plans. Among these firms, 105 firms convey true signals and 56 firms convey false signals. During the period from the day before the event day to the day after the event day

Table 4: Descriptive Statistical Analysis Results

All Samples (N = 664)				
Variables	**Mean**	**STD Error**	**Min.**	**Max.**
CAR(0,0)	0.19	1.63	-6.31	15.1
CAR(-1,1)	1.48	2.71	-7.77	11.5
SIGNAL	0.66	0.48	0	1
Ln(Size)	15.4	1.29	12.4	21.2
BM	1.48	0.80	0.10	5.02
IOR	36.9	14.3	7.01	91.6
IPR	18.4	29.3	0	193
GRW	1.92	51.4	-89.6	682
CAP	-0.07	0.11	-0.95	0
DER	1.58	2.93	0.01	43.0
CDY	3.83	3.58	0	25.4
DevA	5.40	8.52	0	44.6
DevB	34.9	21.8	-34.1	92.1
DA	-0.003	0.062	0.471	-0.280

The regression model is
$CAR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$; *Dependent variable CAR presents cumulative abnormal return, CAR(0,0) is average CAR on the announcement day of share repurchases, CAR(-1,1) presents average CAR from previous one day to next one day of the announcement day. The dummy variable SIGNAL indicates whether the conveyed signals are true or false. SIGNAL indicates true signals if its value is 1 and false signals if its value is 0. Ln(Size) is firm size taken the logarithm. BM is the book-to-market ratio. IOR is insider ownership ratio. IPR is insider pledge ratio. GRW is revenue growth rate. CAP is expense to capital ratio. DER is debt to equity ratio. CDY is cash dividend yield. DevA is deviation between voting right and cash distribution right. DevB is deviation between director right and cash distribution right. DA is discretionary accruals, as the proxy variable to measure the degree of accrual earnings management, and measure the space of the administering authority's earnings management allowed by certified accountants.*

Table 5: Distribution of the Firms with Earnings Management in Different Industries

Industry	Positive Discretionary Accruals (Ratio, %)		Negative Discretionary Accruals (Ratio, %)	
Construction & Building Materials	38	(12.3)	25	(7.02)
Food & Department Store	11	(3.57)	6	(1.68)
Plastics & Chemicals	26	(8.44)	18	(5.06)
Textiles	20	(6.49)	18	(5.06)
Electrical & Mechanics	23	(7.47)	20	(5.62)
Electronics	190	(61.7)	269	(75.6)
Total Samples	308	(100.0)	356	(100.0)

The numerical values contained in brackets indicate the proportion of sampled industry in total samples.

(the event window is (-1, +1)), the abnormal return of the firms with a high degree of earnings management and high actual fulfillment rate is higher than the abnormal return of the firms with a high degree of earnings management and low actual fulfillment rate. The result of a t-test indicates statistical significance at the 5% level. It shows that the market reaction to the true signals is more significant than that of the false signals. In Table 6, Panel C lists the data on the downward revision of earnings forecasts regarding the 664 firms who announced stock repurchase plans. Among the 664 firms, 123 firms convey true signals and 60 convey false signals. On the event day (the event window is (0, 0)), the abnormal return of the firms with a high degree of earnings management and high actual fulfillment rate is higher

than the abnormal return of the firms with a low degree of earnings management and low actual fulfillment rate. The result of a t-test indicates significance at the 5% level. It shows that the market reaction to the true signals is more significant than that of the false signals. In Table 7, Panel A lists the data on 664 firms that announced stock repurchase plans. Judging by the upward revision of the earnings forecast, 105 firms convey true signals; judging by the downward revision of the earnings forecast, 60 firms convey false signals. On the event day (the event window is (0, 0)), the abnormal return of the firms with a high degree of upward revision of earnings forecasts and high actual fulfillment rate is higher than the abnormal return of the firms with a low degree of downward revision of earnings forecasts and low actual fulfillment rate. The result of a t-test indicates statistical significance at the 5% levels. It shows that the market reaction to the true signals is more significant than that of the false signals.

Table 6: Statistics of *CAR* on the Earnings Management as Announcement of Stock Repurchase Plan

Event Window (t₁,t₂) t(*SCAR*)	**Panel A:** The statistics of *CAR* on the absolute values of earnings management after announcement of stock repurchase plan			**Panel B:** The statistics of *CAR* on the upward revision of the earnings forecast, the after announcement of stock repurchase plan			**Panel C:** The statistics of *CAR* on the downward revision of the earnings forecast, the after announcement of stock repurchase plan		
	Abs	**Abs**	**Differen**	**(+) True**	**(+) False**	**Differen**	**(-) True**	**(-) False**	**Differen**
(0,0)	0.277***	0.058	0.218	0.332**	0.250	0.082	0.262**	-0.197	0.459**
	(2.77)	(0.473)	(1.38)	(2.10)	(1.32)	(0.333)	(2.02)	(-1.21)	(2.21)
(-1,+1)	1.72***	1.26***	0.459*	1.85***	0.933***	0.912**	1.68***	1.36***	0.318
	(10.3)	(5.72)	(1.66)	(6.94)	(2.91)	(2.19)	(7.74)	(4.53)	(0.858)
(0,2)	2.07***	1.96***	0.106	1.96***	1.97***	-0.010	2.18***	1.76***	0.420
	(10.3)	(7.65)	(0.326)	(6.61)	(5.10)	(-0.020)	(8.07)	(5.24)	(0.972)
(0,3)	2.06***	2.22***	-0.159	2.03***	2.10***	-0.061	2.12***	2.17***	-0.054
	(8.99)	(7.72)	(-0.433)	(5.90)	(4.95)	(-0.112)	(6.90)	(5.44)	(-0.107)
(-1,2)	1.92***	1.72***	0.205	1.74***	1.40***	0.340	2.13***	1.79***	0.342
	(9.69)	(6.47)	(0.616)	(5.67)	(3.52)	(0.678)	(8.17)	(5.12)	(0.785)
(-1,5)	2.21***	2.30***	-0.086	2.19***	1.77***	0.419	2.28***	2.58***	-0.294
	(9.23)	(7.24)	(-0.217)	(6.00)	(3.72)	(0.698)	(7.14)	(6.10)	(-0.555)

The regression model is $CAR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$ *; The average CAR is estimated through the market model, abnormal returns are checked through the standardized-residual cross-sectional method and t (SCAR) indicates the t-value in the standardized-residual cross-sectional method. Abs True indicates the abnormal returns arising from a true signal represented by the absolute values of earnings management, Abs False indicates the abnormal returns arising from a false signal represented by the absolute values of earnings management, (+) True indicates the abnormal returns arising from a true signal represented by the upward revision of the earnings forecast, (+) False indicates the abnormal returns arising from a false signal represented by the upward revision of the earnings forecast, (-) True indicates the abnormal returns arising from a true signal represented by the downward revision of earnings forecast, and (-) False indicates the abnormal returns arising from a false signal represented by the downward revision of the earnings forecast. The difference is equal to the difference between the abnormal returns arising from a true signal and the abnormal returns arising from a false signal. ***, **, and * indicate that the statistics reach the significance levels of 1%, 5%, and 10%, respectively.*

In Table 7, Panel B lists the data regarding the 664 firms that announced stock repurchase plans. Judging by the upward revision of earnings forecasts, there are 123 firms who convey true signals and judging by the downward revision of earnings forecasts, there are 56 firms who convey false signals. During the period from the previous first day of the event day to the next first day of the event day (the event window is (-1, +1)), the abnormal return of the firms with a high degree of downward revision of earnings forecasts and high actual fulfillment rate is higher than the abnormal return of the firms with a high degree of upward revision of earnings forecasts and low actual fulfillment rate. The result of a t-test

indicates significance at the 10% level. It shows that the market reaction to the true signals is more significant than that of the false signals. According to the results described in Tables 6 and 7, the abnormal returns of the firms conveying true signals is higher than the abnormal return of the firms conveying false signals. Therefore, the aforementioned hypothesis is preliminarily verified. According to the results described in Tables 6 and 7, the abnormal return is significant in the event windows (0, 0) and (−1, +1), but not significant in other event windows. Therefore, this paper does not conduct any subsequent regression analysis for the event windows with no significant abnormal return. The significant *CAR* values produced in the two event windows are used as dependent variables for the regression analysis.

Regression Analysis

The regression equation, equation (1), incorporates a dummy variable representing true or false signals to discuss the influence on abnormal returns exerted by the announcement of stock repurchase plans. The research data is divided into two parts, the first part of the data is used for the analysis of all observations. The second part of data is used for an additional test. For example, a robustness test (the top 1% and bottom 1% extreme values are removed), classification of the observations by industries (firms in hi-tech industry and firms in traditional industries). The classification of the observations by repurchase purposes (Purpose 1 is to transfer shares to employees, and Purpose 3 is to support the stock prices), and classification of the observations by the bearish period or bullish period.

Tables 8 and 9 describe the regression results for all the observations and the robustness test (the top 1% and bottom 1% extreme values are removed). The market reaction to true signals (specifically, downward revision of the earnings forecast, and positive earnings management) is more significant than that to false signals (specifically, negative earnings management) on the event day; in other words, the true signals result in a significant, positive abnormal return on the event day. This result shows that stock repurchases indeed have the desired effect on the current day, thus verifying Hypothesis (when firms announce their stock repurchase plans, the *CAR* arising from the true signals is higher than the *CAR* arising from the false signals). Although the market reaction to true signals (specifically, upward revision of the earnings forecast, and positive earnings management) is more significant than that to false signals (specifically, negative earnings management), the *IOR* has a significant influence on the abnormal returns in the event windows (0, 0) and (-1, 1). This shows that the *IOR* is correlated with the firms' stock prices, and the firms' development trends can be judged by the *IOR*. Therefore, the *IOR* has a certain influence on the abnormal returns resulting from the announcement of stock repurchase plans. Tables 10 and 11 describe the regression results for the hi-tech industry and the traditional industries. In the hi-tech industry, the firms with a downward revision of the earnings forecast display a significant positive abnormal return in the event window (0, 0), and the coefficient value is 0.67; for the firms with an upward revision of earnings forecast (true signals are conveyed) and firms with a downward revision of earnings forecast (false signals are conveyed), a significant positive abnormal return is produced in the event window (0, 0), and the coefficient values are 0.70 and 0.67 respectively. In the traditional industries, for the firms with a downward revision of earnings forecast (true signals are conveyed) and firms with an upward revision of earnings forecast (false signals are conveyed), a significant positive

abnormal return is produced in the event window (-1, 1), and the coefficient value is 1.73. In sum, the hi-tech industry has a significant positive abnormal return in three circumstances, while the traditional industries have a significant positive abnormal return in one circumstance only. Therefore, the hi-tech industry has more significant abnormal returns than traditional industries. In the hi-tech industry, the market reaction to the signals conveyed by firms is very significant; this is consistent with Hypothesis (when firms announce their stock repurchase plans, the *CAR* arising from the true signals is higher than the *CAR* arising from the false signals). Panel B in Table 11 lists the regression results for Purpose 1 and Purpose 3. Purpose 1 is to transfer shares to employees, and Purpose 3 is to maintain firm credit and shareholders' equity and cancel the related shares. On the day before, and the day after the announcement day, the firms with Purpose 3 have more significant positive abnormal returns than the firms with Purpose

1. Therefore, the market reaction to Purpose 3 is more significant than that to Purpose 1; for the firms with Purpose 3 that make a downward revision of the earnings forecast (a true signal) and make an upward revision of the earnings forecast (a false signal), the *CDY* coefficients are 0.08 and 0.18, respectively, in the event windows (0, 0) and (-1, 1), indicating a significant, positive abnormal return. This shows that upon the announcement of stock repurchase plans, a high *CDY* will attract investors to purchase the stocks of the firms. Therefore, for the firms with Purpose 3, *CDY* influences on the firms' *CAR*. In contrast, no significant *CAR* is observed for the firms with Purpose 1, so Hypothesis cannot be verified.

Table 7: Statistics of *CAR* on the True or False Share Repurchase Signal after the Upward Revision of Earnings Forecast/ the Downward Revision of Earnings Forecast

Event Window(t_1,t_2)	Panel A: The statistics of *CAR* on the true repurchase signal after the upward revision of earnings forecast and the false repurchase signal after the downward revision of earnings forecast			Panel B: The statistics of *CAR* on the true repurchase signal after the downward revision of earnings forecast and the false repurchase signal after the upward revision of earnings forecast		
	(+) True	**(-) False**	**Difference**	**(-) True**	**(+) False**	**Difference**
(0,0)	0.332**	-0.197	0.529**	0.262**	0.250	0.012
	(2.10)	(-1.21)	(2.33)	(2.02)	(1.32)	(0.052)
(-1,+1)	1.85***	1.36***	0.485	1.68***	0.933***	0.745*
	(6.94)	(4.53)	(1.21)	(7.74)	(2.91)	(1.93)
(0,2)	1.96***	1.76***	0.194	2.18***	1.97***	0.216
	(6.61)	(5.24)	(0.433)	(8.07)	(5.10)	(0.458)
(0,3)	2.03***	2.17***	-0.139	2.12***	2.09***	0.024
	(5.90)	(5.44)	(-0.264)	(6.90)	(4.95)	(0.047)
(-1,2)	1.74***	1.79***	-0.052	2.13***	1.40***	0.734
	(5.66)	(5.12)	(-0.111)	(8.17)	(3.52)	(1.55)
(-1,5)	2.19***	2.58***	-0.385	2.28***	1.77***	0.510
	(6.00)	(6.10)	(-0.689)	(7.14)	(3.72)	(0.890)

The regression model is
$CAR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} +$
$\alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$ *; The average CAR is estimated through the market model, abnormal returns are checked through the standardized-residual cross-sectional method, and t (SCAR) indicates the t-value in the standardized-residual cross-sectional method. (+) True indicates the abnormal returns arising from a true signal represented by the upward revision of the earnings forecast, (+) False indicates the abnormal returns arising from a false signal represented by the upward revision of the earnings forecast, (-) True indicates the abnormal returns arising from a true signal represented by the downward revision of earnings forecast, and (-) False indicates the abnormal returns arising from a false signal represented by the downward revision of the earnings forecast. The difference is equal to the difference between the abnormal returns arising from a true signal and the abnormal returns arising from a false signal. ***, **, and * indicate that the statistics reach the significance levels of 1%, 5%, and 10%, respectively.*

Table 8: Regression Analysis Results of All Observations

Variables	Panel A: The statistics of CAR after the upward revision of earnings forecast, the true repurchase signal > the false repurchase signal		Panel B: The statistics of CAR after the downward revision of earnings forecast, the true repurchase signal > the false repurchase signal		Panel C: The statistics of CAR after the upward revision of earnings forecast on the true repurchase signal > The statistics of CAR after the downward revision of earnings forecast on the false repurchase signal		Panel D: The statistics of CAR after the downward revision of earnings forecast on the true repurchase signal > The statistics of CAR after the upward revision of earnings forecast on the false repurchase signal	
Model	**(1)** $CAR(0,0)$	**(2)** $CAR(-1,1)$	**(1)** $CAR(0,0)$	**(2)** $CAR(-1,1)$	**(1)** $CAR(0,0)$	**(2)** $CAR(-1,1)$	**(1)** $CAR(0,0)$	**(2)** $CAR(-1,1)$
Intercept	2.47 ***	3.68 ***	0.13	1.99**	1.42**	3.08***	0.90	2.43**
	(3.51)	(2.85)	(0.22)	(1.97)	(2.20)	(2.63)	(1.37)	(2.25)
$SIGNAL$	-0.09	0.55	0.55**	0.43	0.45*	0.44	-0.01	0.49
	(-0.32)	(1.00)	(2.17)	(0.98)	(1.63)	(0.87)	(-0.04)	(1.09)
$ln(Size)$	0.00	-0.00	-0.00*	-0.00	-0.00	-0.00	-0.00*	-0.00**
	(0.29)	(-0.74)	(-1.80)	(-1.56)	(-0.55)	(-0.49)	(-1.62)	(-2.24)
BM	-0.37	-0.17	-0.08	-0.16	-0.26	0.04	-0.13	-0.50
	(-1.56)	(-0.40)	(-0.41)	(-0.51)	(-1.16)	(0.09)	(-0.64)	(-1.49)
IOR	-0.03***	-0.04**	-0.01	-0.01	-0.03***	-0.04**	-0.01	-0.02
	(-3.11)	(-2.19)	(-0.78)	(-0.76)	(-2.86)	(-2.10)	(-0.84)	(-1.01)
IPR	-0.00	-0.01	0.00	-0.00	0.00	-0.00	-0.00	-0.01
	(-1.14)	(-1.16)	(0.95)	(-0.27)	(0.09)	(-0.08)	(-0.12)	(-1.58)
GRW	-0.00*	-0.00	0.00	0.01	0.01	0.01	-0.00	-0.00
	(-1.66)	(-0.56)	(1.30)	(1.27)	(1.23)	(0.83)	(-1.45)	(-0.73)
CAP	0.16	-0.25	-1.67	-2.08	-0.18	-0.25	-1.16	-2.42
	(0.11)	(-0.10)	(-1.21)	(-0.88)	(-0.13)	(-0.10)	(-0.80)	(-1.01)
DER	0.16	0.04	-0.04	-0.04	0.11	0.11	-0.02	-0.01
	(1.11)	(0.14)	(-1.01)	(-0.64)	(0.75)	(0.40)	(-0.65)	(-0.25)
CDY	-0.02	-0.01	0.01	0.09	-0.03	-0.03	0.02	0.13**
	(-0.49)	(-0.11)	(0.22)	(1.35)	(-0.63)	(-0.42)	(0.53)	(2.01)
$DevA$	0.03	0.02	-0.01	0.01	0.03*	0.02	-0.01	0.01
	(1.51)	(0.52)	(-0.38)	(0.37)	(1.72)	(0.63)	(-0.56)	(0.18)
$DevB$	-0.01**	-0.01	0.00	-0.01	-0.01	-0.01	-0.00	-0.00
	(-2.20)	(-1.08)	(0.02)	(-0.71)	(-1.27)	(-0.86)	(-0.14)	(-0.38)
Adj-R^2	0.03	-0.02	0.01	-0.02	0.03	-0.03	-0.03	0.03

The regression model is $AR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$; Model (1) reflects the cumulative abnormal return (CAR) on the event day, and Model (2) reflects the CAR from the day before the event day to the day after the event day. Adj-R^2 is the adjusted correlation coefficient, the numerical values in the table indicate the estimated coefficients of the variables, and the numerical values contained in brackets ( ) indicate the t statistics of the variables. ***, **, and * indicate that the statistics reach significance level of 1%, 5%, and 10%, respectively.

Table 12 lists the regression results for bearish periods and bullish periods. In bearish periods, the downward revision of the earnings forecast results in a significant abnormal return in the event windows (0, 0) and (−1, 1); the upward revision of the earnings forecast (a true signal) and downward revision of the earning forecast (a false signal) also result in a significant abnormal return in the event window (0, 0). However, no significant abnormal returns are observed in bullish periods. In sum, a significant, positive abnormal return

Table 9: Robustness Test Results of All Observations (Removed the Top 1% and Bottom 1% Extreme Values of All Observations)

Variables	Panel A: The statistics of CAR after the upward revision of earnings forecast, the true repurchase signal > the false repurchase signal		Panel B: The statistics of CAR after the downward revision of earnings forecast, the true repurchase signal > the false repurchase signal		Panel C: The statistics of CAR after the upward revision of earnings forecast on the true repurchase signal > The statistics of CAR after the downward revision of earnings forecast on the false repurchase signal		Panel D: The statistics of CAR after the downward revision of earnings forecast on the true repurchase signal > The statistics of CAR after the upward revision of earnings forecast on the false repurchase signal	
Model	**(1)** $CAR(0,0)$	**(2)** $CAR(-1,1)$	**(1)** $CAR(0,0)$	**(2)** $CAR(-1,1)$	**(1)** $CAR(0,0)$	**(2)** $CAR(-1,1)$	**(1)** $CAR(0,0)$	**(2)** $CAR(-1,1)$
Intercept	2.32***	3.27***	-0.14	2.09**	1.30**	2.74**	0.60	2.54**
	(3.55)	(2.79)	(-0.24)	(2.14)	(2.15)	(2.54)	(0.96)	(2.42)
SIGNAL	-0.09	0.48	0.51**	0.32	0.49*	0.42	-0.05	0.37
	(-0.34)	(0.97)	(2.09)	(0.75)	(1.91)	(0.91)	(-0.17)	(0.85)
ln(Size)	0.00	-0.00	-0.00*	-0.00	-0.00	-0.00	-0.00	-0.00**
	(0.17)	(-1.16)	(-1.73)	(-1.47)	(-0.79)	(-0.93)	(-1.54)	(-2.14)
BM	-0.37*	-0.21	-0.03	-0.09	-0.27	0.01	-0.09	-0.41
	(-1.69)	(-0.54)	(-0.14)	(-0.28)	(-1.30)	(0.03)	(-0.45)	(-1.26)
IOR	-0.03***	-0.04**	-0.01	-0.02	-0.03***	-0.04**	-0.01	-0.02
	(-3.07)	(-2.02)	(-0.58)	(-0.97)	(-2.85)	(-1.97)	(-0.59)	(-1.21)
IPR	-0.01	-0.01	0.01	-0.00	-0.00	-0.00	0.00	-0.01
	(-1.33)	(-1.21)	(1.12)	(-0.16)	(-0.11)	(-0.14)	(0.03)	(-1.53)
GRW	-0.00*	-0.00	0.00*	0.01	0.01	0.01	-0.00	-0.00
	(-1.69)	(-0.49)	(1.60)	(1.36)	(1.37)	(1.15)	(-1.43)	(-0.63)
CAP	0.54	0.39	-1.74	-2.08	0.16	0.47	-1.28	-2.27
	(0.41)	(0.17)	(-1.33)	(-0.91)	(0.12)	(0.20)	(-0.93)	(-0.98)
DER	0.13	0.00	-0.04	-0.05	0.09	0.08	-0.03	-0.02
	(1.02)	(0.01)	(-1.16)	(-0.75)	(0.67)	(0.30)	(-0.79)	(-0.36)
CDY	-0.03	0.01	0.02	0.06	-0.03	-0.02	0.04	0.10
	(-0.70)	(0.09)	(0.64)	(0.95)	(-0.84)	(-0.26)	(0.95)	(1.56)
DevA	0.04**	0.03	-0.01	0.02	0.04**	0.03	-0.01	0.01
	(2.09)	(1.10)	(-0.38)	(0.61)	(2.24)	(1.11)	(-0.57)	(0.43)
DevB	-0.01*	-0.01	0.00	-0.01	-0.00	-0.00	0.00	-0.00
	(-1.66)	(-0.58)	(0.13)	(-0.76)	(-0.73)	(-0.41)	(0.02)	(-0.43)
Adj-R^2	0.04	-0.01	0.02	-0.02	0.05	-0.02	-0.03	0.02

The regression model is $AR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$ *; Model (1) reflects the cumulative abnormal return (CAR) on the event day, and Model (2) reflects the CAR from the day before the event day to the day after the event day. Adj-R^2 is the adjusted correlation coefficient, the numerical values in the table indicate the estimated coefficients of the variables, and the numerical values contained in brackets ( ) indicate the t statistics of the variables. ***, **, and * indicate that the statistics reach significance level of 1%, 5%, and 10%, respectively*

Table 10: Regression Analysis Results of Hi-Tech Industry / Traditional Industry

Variables	Panel A: The statistics of *CAR* after the downward revision of earnings forecast, the true repurchase signal > the false repurchase signal				Panel B: The statistics of *CAR* after the upward revision of earnings forecast on the true repurchase signal > The statistics of *CAR* after the downward revision of earnings forecast on the false repurchase signal			
	Hi-Tech Industry		**Traditional Industry**		**Hi-Tech Industry**		**Traditional Industry**	
Model	(1) CAR(0,0)	(2) CAR(-1,1)	(1) CAR(0,0)	(2) CAR(-1,1)	(1) CAR(0,0)	(2) CAR(-1,1)	(1) CAR(0,0)	(2) CAR(-1,1)
Intercept	0.20	2.59**	0.06	1.97	1.49*	3.05**	1.00	1.67
	(0.28)	(2.23)	(0.04)	(0.79)	(1.93)	(2.26)	(0.70)	(0.62)
SIGNAL	0.67**	0.44	0.23	0.71	0.70**	0.91	-0.24	-0.82
	(2.10)	(0.84)	(0.49)	(0.83)	(1.98)	(1.46)	(-0.49)	(-0.89)
ln(Size)	-0.00*	-0.00	-0.00	-0.00**	-0.00	-0.00	0.00	0.00*
	(-1.95)	(-1.55)	(-0.64)	(-2.17)	(-0.42)	(-0.75)	(0.19)	(1.96)
BM	-0.27	-0.39	0.28	0.13	-0.21	-0.06	-0.01	1.19
	(-1.11)	(-0.99)	(0.59)	(0.14)	(-0.78)	(-0.13)	(-0.02)	(1.13)
IOR	-0.02	-0.04*	0.01	0.01	-0.04***	-0.05**	0.00	0.01
	(-1.22)	(-1.62)	(0.27)	(0.34)	(-3.12)	(-2.33)	(0.12)	(0.27)
IPR	-0.00	-0.01	0.01**	0.01	-0.00	0.01	-0.00	-0.01
	(-0.63)	(-1.02)	(2.02)	(0.72)	(-0.43)	(0.59)	(-0.05)	(-1.05)
GRW	0.00	0.01	0.01*	0.00	0.01	0.02	0.00	-0.00
	(0.65)	(0.97)	(1.62)	(0.53)	(1.14)	(1.49)	(0.54)	(-0.33)
CAP	-2.09	-2.52	-0.40	-4.95	0.05	3.80	-0.78	-3.84
	(-1.24)	(-0.91)	(-0.15)	(-1.01)	(0.02)	(0.97)	(-0.37)	(-0.96)
DER	0.18	0.19	-0.07*	-0.11	0.13	0.17	-0.24	-0.45
	(0.95)	(0.59)	(-1.69)	(-1.53)	(0.68)	(0.51)	(-0.72)	(-0.73)
CDY	0.02	0.11	-0.01	0.05	-0.02	0.03	-0.07	-0.17
	(0.40)	(1.41)	(-0.07)	(0.36)	(-0.37)	(0.32)	(-0.81)	(-1.03)
DevA	-0.01	-0.00	0.00	0.05	0.03	0.04	0.03	-0.02
	(-0.28)	(-0.13)	(0.06)	(0.89)	(1.10)	(0.84)	(0.80)	(-0.31)
DevB	0.00	-0.01	-0.02	-0.02	-0.01	-0.01	-0.01	-0.03
	(0.47)	(-0.46)	(-1.32)	(-1.07)	(-0.77)	(-0.56)	(-0.84)	(-1.31)
Adj-R^2	0.01	-0.00	0.08	0.09	0.06	-0.00	-0.20	-0.05

The regression model is $AR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$; Model (1) reflects the cumulative abnormal return (CAR) on the event day, and Model (2) reflects the CAR from the day before the event day to the day after the event day. Adj-R^2 is the adjusted correlation coefficient, the numerical values in the table indicate the estimated coefficients of the variables, and the numerical values contained in brackets ( ) indicate the t statistics of the variables. ***, **, and * indicate that the statistics reach significance level of 1%, 5%, and 10%, respectively.

is observed under four circumstances in bearish periods, whereas no significant abnormal returns are observed in bullish periods. It shows that upon the announcement of stock repurchase plans, it can be observed that only in bearish periods are the abnormal returns arising from the true signals higher than the

Table 11: Regression Analysis Results of Hi-Tech Industry / Traditional Industry/ Repurchase Purpose

Variables	Panel A: The statistics of *CAR* after the downward revision of earnings forecast on the true repurchase signal > The statistics of *CAR* after the upward revision of earnings forecast on the false repurchase signal				Panel B: The statistics of *CAR* after the downward revision of earnings forecast on the true repurchase signal > The statistics of *CAR* after the upward revision of earnings forecast on the false repurchase signal			
	Hi-Tech Industry		**Traditional Industry**		**Transfer Shares to Employees**		**Maintain Firm Credit and Shareholders' Equity**	
Model	(1) *CAR*(0,0)	(2) *CAR*(-1,1)	(1) *CAR*(0,0)	(2) *CAR*(-1,1)	(1) *CAR*(0,0)	(2) *CAR*(-1,1)	(1) *CAR*(0,0)	(2) *CAR*(-1,1)
Intercept	1.35*	3.46***	1.26	2.42	1.90*	2.55	0.33	1.64
	(1.63)	(2.72)	(0.91)	(0.93)	(1.74)	(1.51)	(0.38)	(1.04)
SIGNAL	-0.30	0.29	0.39	1.73**	-0.05	-0.02	0.15	1.16*
	(-0.77)	(0.48)	(1.02)	(2.37)	(-0.11)	(-0.03)	(0.41)	(1.70)
ln(Size)	-0.00*	-0.00**	-0.00	-0.00	-0.00	0.00	-0.00	-0.00**
	(-1.92)	(-2.31)	(-0.39)	(-1.45)	(-0.39)	(1.13)	(-0.98)	(-2.44)
BM	-0.28	-0.63	-0.14	-0.92	-0.27	0.25	0.00	-0.74
	(-0.99)	(-1.45)	(-0.39)	(-1.35)	(-0.72)	(0.44)	(0.01)	(-1.54)
IOR	-0.02	-0.05**	-0.01	0.01	-0.02	-0.02	-0.01	-0.00
	(-1.16)	(-2.13)	(-0.58)	(0.38)	(-1.13)	(-1.05)	(-0.48)	(-0.12)
IPR	-0.01*	-0.02*	0.01	-0.01	0.00	-0.01	-0.01	-0.01
	(-1.83)	(-1.60)	(1.39)	(-0.99)	(0.34)	(-1.10)	(-0.86)	(-0.63)
GRW	-0.00	0.00	-0.00*	-0.00	-0.00	0.00	-0.00**	-0.00
	(-0.26)	(0.14)	(-1.66)	(-1.53)	(-0.29)	(0.41)	(-2.08)	(-0.56)
CAP	-2.11	-5.33*	1.59	-0.10	1.50	2.03	-1.20	-4.19
	(-1.13)	(-1.86)	(0.61)	(-0.02)	(0.56)	(0.49)	(-0.56)	(-1.08)
DER	0.12	-0.05	-0.02	0.02	-0.02	-0.04	0.05	-0.32
	(0.51)	(-0.14)	(-0.66)	(0.24)	(-0.37)	(-0.58)	(0.20)	(-0.71)
CDY	0.07	0.16**	-0.07	0.18	-0.10	0.08	0.08*	0.18*
	(1.30)	(1.96)	(-1.06)	(1.49)	(-1.05)	(0.56)	(1.72)	(2.09)
DevA	-0.02	-0.02	0.00	0.02	-0.02	0.02	0.00	-0.01
	(-0.68)	(-0.56)	(0.07)	(0.45)	(-0.88)	(0.54)	(0.16)	(-0.10)
DevB	0.00	-0.00	-0.01	-0.02	0.01	-0.01	-0.01	0.00
	(0.12)	(-0.20)	(-0.78)	(-1.00)	(0.51)	(-0.88)	(-0.91)	(0.09)
Adj-R^2	-0.01	0.06	0.03	0.19	-0.05	-0.05	-0.01	0.04

*The regression model is $AR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$; Model (1) reflects the cumulative abnormal return (CAR) on the event day, and Model (2) reflects the CAR from the day before the event day to the day after the event day. Purpose 3 is to maintain firm credit and shareholders' equity and cancel the related shares, and Purpose 1 is to transfer shares to employees. Adj-R^2 is the adjusted correlation coefficient, the numerical values in the table indicate the estimated coefficients of the variables, and the numerical values contained in brackets ( ) indicate the t statistics of the variables. ***, **, and * indicate that the statistics reach significance level of 1%, 5%, and 10%, respectively.*

abnormal returns arising from the false signals. Therefore, abnormal returns of firms comply with Hypothesis only in bearish periods. According to the analysis of Table 12, the market reaction to the announcement of stock repurchase plans varies with the degree of earnings management and types of samples. For all samples and robustness test (the top 1% and bottom 1% extreme values are removed), the results are consistent, complying with Hypothesis. When all the observations are classified into firms in

hi-tech industry and firms in traditional industries, the *CAR* in the hi-tech industry is more significant than the *CAR* in traditional industries. Therefore, the analysis results about the firms in the hi-tech industry are consistent with Hypothesis. When all the observations are classified by the purpose of stock repurchases, the analysis results regarding Purpose 3 are consistent with Hypothesis, whereas Hypothesis cannot be verified for the enterprises with Purpose 1. When all the observations are classified by bearish or bullish periods, no significant abnormal returns are observed in any event window in bullish periods, so Hypothesis cannot be verified; in contrast, the analysis results regarding the observations in bearish periods are consistent with Hypothesis. Possibly, an information asymmetry exists between firm managers and market participants. Therefore, a significant, the positive abnormal return is produced in the short term if the stock prices of firms are underestimated and the firms convey true signals (specifically, a below-average degree of earnings management and an above-average fulfillment rate) to market. When abnormal returns arising from a true signal are indeed higher than the abnormal returns arising from a false signal, the stock market is able to reflect the effect of the signals (true or false) on the announcement day, but does not need to judge the signals (true or false) when stock repurchases is subsequently fulfilled. This shows that the signals can indeed reflect the effect of the announcement of stock repurchase plans.

CONCLUSIONS

There exists an information asymmetry between firm managers and market participants. When firms announce stock repurchase plans in Taiwan's open stock market, they may give investors a signal that their stock prices are underestimated, and lead investors to react to the announcement, with the intent to boost the stock prices to their true value. For their own benefits, however, firm managers may convey false signals to the investors through earnings manipulation. In other words, the firms' stock prices are not underestimated, but the firm managers try to convince market participants that their firm equity is underestimated, thus misleading market participants into making incorrect decisions. This study further explores how the financial statements with earnings manipulation influence stock prices. This study is oriented toward the stock repurchase events regarding Taiwan's publicly listed firms and tries to explore the relationship between earnings management before the announcement of stock repurchase plans and actual fulfillment rate. Among all sampled firms, for the firms with a below-average degree of upward/downward revision of earnings forecasts on the announcement day and an above-average actual fulfillment rate, market reaction to true signals is more significant than that to false signals (specifically, a significant positive abnormal return is observed). This result is consistent with the results obtained in the robustness test (the top 1% and bottom 1% extreme values are removed).

Evidently, investor reactions to the announcement of stock repurchase plans somewhat vary with the signals (true or false) conveyed by firm managers. Abnormal returns arising from true signals are higher than those arising from false signals are; this is consistent with Hypothesis. Further, the phenomenon described in Hypothesis is more significant in the hi-tech industry than in traditional industries. For the firms with Purpose 3, a significant, positive abnormal return is observed on the day before and the day after the announcement day. However, this result cannot be observed for the firms with Purpose 1. For the firms that announce stock repurchase plans in bullish periods, abnormal returns are not significant; for the firms that announce stock repurchases in bearish periods, a significant, positive abnormal return is observed. This shows that abnormal returns vary with the periods in which stock repurchase plans are announced. In bearish periods, the conclusion about the observations is consistent with Hypothesis. Therefore, investors must give careful consideration when making decisions, and observe whether firms intend to cover up their earnings management decisions by announcing stock repurchase plans. Abnormal returns are significant only when the firms convey true signals. Investors should stay away from firms with high discretionary accruals but invest in firms with low discretionary accruals. The paper is limited in the selection of Taiwanese listed firms as the research object and collected data from the database of the Taiwan Economic Journal (TEJ). Some are not included in the sample. Firms demoted as full-cash delivery stocks, financial and securities firms, and industries with less than 15 sample firms are notably absent from the sample. In a future study, another interesting extension of this paper would be a more detailed examination of correlation between earnings management induced financial distress and stock

repurchase plans affected trade union. In a further study, we could put firm age and the downward/ upward revision of the earnings forecast frequency into the model to examine how earnings management induced stock repurchase plans affect stock price volatility.

Table 12: The Regression Analysis Results of Bullish Periods/ Bearish Periods

Variables	Panel A: The statistics of *CAR* after the downward revision of earnings forecast, the true repurchase signal > the false repurchase signal				Panel B: The statistics of *CAR* after the upward revision of earnings forecast, the true repurchase signal > The statistics of *CAR* after the downward revision of earnings forecast on the false repurchase signal			
	Bullish Period		**Bearish Period**		**Bullish Period**		**Bearish Period**	
Model	**(1)** *CAR*(0,0)	**(2)** *CAR*(-1,1)	**(1)** *CAR*(0,0)	**(2)** *CAR*(-1,1)	**(1)** *CAR*(0,0)	**(2)** *CAR*(-1,1)	**(1)** *CAR*(0,0)	**(2)** *CAR*(-1,1)
Intercept	0.47	2.69**	-0.62	1.29	2.15*	6.03***	0.58	1.16
	(0.55)	(1.97)	(-0.71)	(0.86)	(1.70)	(2.84)	(0.71)	(0.74)
SIGNAL	0.20	-0.35	0.76**	1.00*	0.47	0.13	0.61*	0.34
	(0.50)	(-0.55)	(2.16)	(1.67)	(0.97)	(0.16)	(1.64)	(0.48)
ln(Size)	-0.00**	0.00	0.00	-0.00**	-0.00	-0.00	0.00	-0.00
	(-2.06)	(0.32)	(0.09)	(-2.52)	(-1.16)	(-0.63)	(1.54)	(-0.42)
BM	0.35	-0.03	-0.06	-0.09	-0.31	0.10	-0.11	0.15
	(0.95)	(-0.05)	(-0.23)	(-0.23)	(-0.60)	(0.11)	(-0.43)	(0.29)
IOR	-0.02	-0.02	0.00	-0.02	-0.04***	-0.07***	-0.02	-0.02
	(-1.34)	(-0.96)	(0.02)	(-0.54)	(-2.61)	(-2.62)	(-1.32)	(-0.67)
IPR	0.00	-0.01	0.01	0.01	0.00	-0.01	0.00	0.00
	(0.55)	(-1.31)	(1.10)	(0.93)	(0.04)	(-0.46)	(0.16)	(0.45)
GRW	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.02
	(1.53)	(1.33)	(1.47)	(0.69)	(1.18)	(0.36)	(0.71)	(1.21)
CAP	-0.40	-0.93	-2.29	-2.86	1.04	2.27	0.42	-1.18
	(-0.17)	(-0.24)	(-1.28)	(-0.94)	(0.30)	(0.39)	(0.26)	(-0.38)
DER	-0.09	0.14	-0.05	-0.07	0.17	0.04	0.05	0.07
	(-0.41)	(0.42)	(-1.16)	(-1.00)	(0.48)	(0.07)	(0.31)	(0.23)
CDY	0.03	0.21**	0.00	0.07	0.02	-0.09	-0.06	-0.00
	(0.48)	(1.99)	(0.04)	(0.71)	(0.20)	(-0.63)	(-1.19)	(-0.05)
DevA	0.05*	0.07	-0.04	-0.02	0.02	-0.02	0.04*	0.05
	(1.69)	(1.61)	(-1.58)	(-0.38)	(0.44)	(-0.37)	(1.71)	(1.09)
DevB	-0.01	-0.02	0.01	-0.00	-0.02	-0.02	-0.00	-0.00
	(-1.57)	(-1.52)	(1.04)	(-0.03)	(-1.39)	(-1.06)	(-0.25)	(-0.16)
Adj-R^2	0.03	0.04	0.01	0.01	-0.01	-0.00	0.03	-0.10

The regression model is $AR(\tau_1, \tau_2) = \alpha_0 + \alpha_1 SIGNAL_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 BM_{i,t} + \alpha_4 IOR_{i,t} + \alpha_5 IPR_{i,t} + \alpha_6 GRW_{i,t} + \alpha_7 CAP_{i,t} + \alpha_8 DER_{i,t} + \alpha_9 CDY_{i,t} + \alpha_{10} DevA_{i,t} + \alpha_{11} DevB_{i,t} + \varepsilon_{i,t}$; Model (1) reflects the cumulative abnormal return (CAR) on the event day, and Model (2) reflects the CAR from the day before the event day to the day after the event day. Adj-R^2 is the adjusted correlation coefficient, the numerical values in the table indicate the estimated coefficients of the variables, and the numerical values contained in brackets ( ) indicate the t statistics of the variables. ***, **, and * indicate that the statistics reach significance level of 1%, 5%, and 10%, respectively.

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