The impact of employee stock options issued by companies on stock repurchases

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Abstract

This study presents significant factors that affect firms' decision whether to repurchase shares or not. Empirical results show that when the debt ratio is lower, the stock price is seriously underpriced and the firm size is larger, firms tend to buyback their own shares. Regarding employee stock options, managers seem to buy more treasury stocks when the levels of these stock options are high. This includes total options outstanding, executive options outstanding, executive options exercisable and unexercisable. Furthermore, firms have a significantly positive effect on the announcement return of stock repurchases prior to companies issuing stock options. This result holds for both long-run and short-run periods. But the long-run return turns to be significantly negative after companies issued stock options. This shows that the signaling hypothesis may be replaced by the option-funding hypothesis. This also implies that employee stock options have a great impact on the decision to stock repurchases.

Keywords: treasury stock, employee stock options, signaling hypothesis, option-substitution hypothesis, option-funding hypothesis.

1. Introduction

Previous studies tended to show whether or not the motives to repurchase stock conform to the signal theory or the free cash flow theory, and their empirical results showed so. However, in the 1990s, repurchased stocks by American companies suddenly increased sharply no matter whether it was the number or the amount, and the compensation policy of those companies changed at the same time- stock options used for employee compensation extended by a large amount. Kahle (2002) indicated one explanation for the increasing popularity of buybacks is that recent innovations in compensation policy, in particular the growing use of stock options by companies, have caused changes in payout policy.

In Taiwan, stock repurchases began in August 9, 2000, while employee stock options (ESOs) were not issued until 2001. Issuing ESOs has become a feature of the compensation polices of Taiwan's companies since 2001. Nevertheless, issuing ESOs would cause dilution effects, and those executives who owned options could make the decision to repurchase in order to increase stock price to gain from ESOs. This study uses financial information of Taiwan's listed companies to investigate if issuing ESOs also plays an important role in the decision to repurchase, and to see how companies set policies of repurchased stock if they hope to avoid dilution effects. Specially, we examine if the number of total outstanding stock options has a positive relation with the number of repurchased stock. In addition, if the executives will influence the decision to repurchase because of the self-interest is another main issue in this study. This can be observed if there is a positive link between the number of repurchased stock and that of stock options holding by executives and non-executives.

Furthermore, ESOs usually have at least a two-year vesting period before being exercised in Taiwan. Therefore, we examine whether the volume of executive "exercisable" and "non-exercisable" options is positively related to that of repurchased stock, which is used to check if the executives still have an influence on the repurchasing decision when their options are already exercisable. Additionally, the relationships among free cash flow, firm size, debt ratio, market-to-book asset ratio, cash dividend, growth opportunities of companies and the volume of repurchased stock are also be examined in this study.

On the other hand, the main motive for repurchasing was referred to the signal theory per previous studies, which showed that there was definitely positive abnormal return at the time of announcement of repurchasing. However in Taiwan, since ESOs have been issued from 2001, has the motive to repurchase been affected by issuing ESOs as the option-substitution hypothesis and the option-funding hypothesis claim? In other words, have there been both short-run and long-run positive abnormal returns following the announcement? Therefore, this study uses the information of the announcement events for the repurchasing in Taiwan's listed companies individually before and after 2001 to see how the compensation system influences the decision to repurchase and the market reaction of a repurchase.

The remainder of this paper proceeds as follows. Section 2 reviews the relative

literature concerning the relationship between repurchased stock and ESOs, hypotheses of factors of a repurchase are established in the section 3, empirical results are presented in the section 4, and the final section summarizes and concludes.

2. Literature Review

2.1. The option-substitution hypothesis

The option-substitution hypothesis means if firms have a lot of free cash flow, they will distribute the profits to shareholders through the decision to buyback or to issue cash dividends. If the decision affects executives' wealth because of option holding, then executives will tend to make the decision to repurchase because dividend issues would decrease option values but repurchases could increase stock price and option value.

Guay and Harford (2000) demonstrated that the way that firms deal with their free cash flow depended upon the characteristic of their flow. If that free cash flow is only used for short-run purposes and not for paying long-term debt, firms would repurchase because it is difficult to decrease the amount of cash dividends to the origin in the following years once cash dividends have been issued at a certain level. The empirical results also showed that dividend-increasing firms did not adjust their cash dividends down to the original level and the option value had a negative relationship with future dividends, therefore, executives would prefer repurchases rather than dividend issues in order to maximize their own option value. Bartov et al. (1998) looked into how the executives made the decision to repurchase or to pay out dividends, and the results showed that executives would tend to repurchase if the firm value was highly undervalued.

Jolls (1988) found that the executive options would play a more important role in the decision to repurchase than non-executive options. Besides, the empirical results of Fenn and Liang (2001) showed that in 1990s, stock options did have a relation with the decision to repurchase but not with the payout dividends. Further, there was a strongly negative relationship between dividends and ESOs; a positive relationship between repurchases and ESOs.

2.2. The option-funding hypothesis

The option-funding hypothesis says that when the employees' options are about to be exercisable in the near future, the company will repurchase stock in the open market to fund employee options exercise. Recently, executive stock options have been largely issued as one of the compensation tools. However, as these options are exercised, EPS will decrease with the increase in total outstanding stock. Therefore, with a view to control the volume of total outstanding stock, the company would rather repurchase than pay dividends.

Generally speaking, investors and analysts focus on the two indicators: EPS and EPS growth. Hence, it is important for firms to avoid the dilution of basic EPS. Dunsby (1994) indicates that firms would tend to repurchase when executives exercise their options. Thus, the more options these executives own, the higher possibility they have of repurchase. Ikenberry and Vermaelen (1996) suggest that depending upon the number of options exercised by employees, the management would adjust the number of shares repurchased in flexibility. Kahle (2002) investigates how ESOs affect the decision to repurchase, and he finds that the larger the number of outstanding options, the greater the actual amount of a repurchase. Ben et al. (2003) imply that exercising ESOs dilutes EPS, and firms will repurchase to increase EPS if earnings are too low to meet a required level. Brav et al. (2005) indicated that the relationship between dividend policies and the earnings was weak, and managers would prefer repurchases than dividends paid out in order to increase EPS.

3. Hypotheses and methodology

This study focuses on the influence on repurchases through an increase in stock options and employee option exercises. Furthermore, we also research other relative causes of repurchases, and check if the motives for repurchases will be affected after issuing ESOs through short-run and long-term market reactions to the announcement of repurchases. Therefore, the hypotheses are divided into two topics: "employee stock options' influence on repurchases" and "the announcement return about repurchases".

3.1. Employee stock options' influence on repurchases

3.1.1. Control variables

When companies have more free cash flows, the amount of actual repurchases will be higher. Jensen (1986) and Jagannathan and Stephens (2003) indicated that companies' capital operation may become inefficient when they own too much free cash flow. Thus, if companies lack good investment projects and have extra capital, repurchasing, which is also good news for investors, will be possibly be carried out. Evans et al. (2003) considered that although the ability to pay debts can be guaranteed because of high free cash flow, the inefficiency of capital use or the message of poor investment opportunities is revealed as well. Therefore, we set the hypothesis that the more companies' free cash flows are, the higher the possibility of repurchases is.

Moreover, the less the companies' leverage is, the larger the amount of actual repurchases is. The amount of debts surely affects companies' payout decisions, and too high leverage probably means that a company is in financial difficulties. Hence, while there are volumes of debts, managers would tend to keep their cash instead of paying out. Kahle (2002) found that companies with an increase in dividends would have higher debt ratios than those with repurchases resulting from the fact that the capital cost would be higher for companies with a high leverage, so fewer shares would be repurchased; while companies with paying dividends could afford more debts because of the possession of a stable cash flow. To sum up, we think that the amount of actual repurchases will be larger if companies' leverage is lower because of their lower capital cost.

In addition, the more serious the undervaluation of firm value is, the larger the amount of actual repurchases is. The signaling hypothesis theory formulated by Ikenberry et al. (1995; 2000) and Chan et al. (2004) shows that if managers think the firm value is undervalued at present, a company will declare a repurchase to raise its stock price. Through an actual repurchase, the company gives outside investors the message of undervaluation to raise the stock price.

The fewer cash dividends issued, the larger the amount of actual repurchases. Vermaelen (1981) and Dann (1981) suggested that if repurchases can make shareholders obtain more profits in tax than the amount of cash dividends, companies

would prefer repurchasing to issuing cash dividends. When cash dividends are issued, the shareholders will have to pay income tax for their profits. On the other hand, if companies repurchase shares, shareholders will only be taxed on stocks exchange and not on capital gain because they can sell their shares back to the firm. Ergo, stockholders can get more tax breaks in repurchases. Accordingly, we think that firms will regard repurchasing as a practical payout decision in place of issuing cash dividends.

The bigger the firm size, the larger the amount of actual repurchases. Kahle (2002) demonstrated that the firm size could tell the amount of a company's capital cost and its degree of asymmetric information: for large companies, their capital costs are lower, free cash flows are more stable, and they have less asymmetric information.

Furthermore, the lower the growth opportunity, the larger the amount of actual repurchases. Nohel and Tarhan (1998) indicated that companies with more growth opportunities would have lower repurchase announcement effects than those with less growth opportunities. According to the free cash flow hypothesis, if a firm owns extra dispensable cash flows, it will make a repurchase to eliminate agency problems. In other words, shareholders of a company with less growth opportunities are pleased with a repurchase. Therefore, we think that the actual amount of a repurchase is greater if a company has less growth opportunities.

3.1.2. Hypotheses of employee stock options' influence on repurchases

Weisbenner (2000) and Fenn and Liang (2001) demonstrated that when employee options are exercised, managers would prefer to repurchase rather than to issue stocks in order to avoid dilution effects. Additionally, Fenn and Liang found that there was a significant relationship between executive stock options and the decision to repurchase. The first hypothesis includes several issues. H1: The volume of employee stock options has a positive relationship with the amount of repurchases. H1a: When there are more total outstanding stock options in the next year, the more shares will be repurchased. H1b: When there are more executive stock options in the next year, the more shares will be repurchased. H1c: When there are more non-executive stock options in the next year, the more shares will be repurchased. H1d: When there are more exercisable executive stock options in the next year, the

more shares will be repurchased. H1e: When there are more unexercisable executive stock options in the next year, the more shares will be repurchased.

3.2. Hypotheses of the announcement return about repurchases

According to the signal theory, the declaration of a repurchase is good news for the market, so the stock price will rise in the short term. Dann's (1981) empirical study concerning the repurchase announcement effects in American enterprises implied that within one day of the repurchase announcement, a significantly positive abnormal return of around 15% could be gained, and the stock price would not go down to the former level before the announcement. Lakonishok and Vermaelen (1990) analyzed American companies' stock price concerning buying their own stocks, and the results showed that there was an abnormal return of over 9% on average during the week in which shares were repurchased.

Ikenberry et al. (1995) revealed that due to the undervaluation of the stock price, executives would release good news of a repurchase, and in this way, the abnormal return not only was up to 45.3% but also lasted for four years. Consequently, we suppose that the positive abnormal return, no matter whether it was in the short term or in the long run, will exist before employee stock options are issued. We have the following two hypotheses. H2: Before employee stock options are issued, there is a short-run positive abnormal return at the announcement of a repurchase. H3: Before employee stock options are issued, there is a long-term positive abnormal return at the announcement of a repurchase.

Once the employee stock option system was established, scholars formulated the option-substitution hypothesis and the option-funding hypothesis. Kahle (2002) investigated how the decision to repurchase was influenced by employee stock options and its market reaction. Though there is still a positive abnormal return in the short term even after stock options are issued, compared with the long-run stock return before stock options are issued, the abnormal return is not supposed to be as high as it was.

Besides, the stock price will probably decline in the long term and the positive return may disappear because the announcement effect has been eliminated by the

effect of the option-substitution hypothesis or of the option-funding hypothesis. Accordingly, we think that after employee stock options are issued, there remains a short-run positive abnormal return that does not exist in the long term. Consequently, we construct the following two hypotheses. H4: After employee stock options are issued, there is a short-run positive abnormal return at the announcement of a repurchase. H5: After employee stock options are issued, there is no long-term abnormal positive stock return at the announcement of a repurchase.

3.3. The model

The following regression examines how employee stock options influence an actual repurchase.

$$REPUR_{i,t} = \alpha_0 + \alpha_1 FCF_{i,t} + \alpha_2 Debt_{i,t} + \alpha_3 MTB_{i,t} + \alpha_4 Div_{i,t} + \alpha_5 Size_{i,t} + \alpha_6 CAPEX_{i,t} + \alpha_7 TSO_{i,t+1} + \varepsilon_{i,t} \quad (1)$$

where $REPUR_{i,t}$ denotes shares actually repurchased by the firms; $FCF_{i,t}$ represents the firms' free cash flows; $Debt_{i,t}$ is the firms' debt ratios; $MTB_{i,t}$ denotes the firms' market-to-book assets ratios; $Div_{i,t}$ is the firms' cash dividends for common stock; $Size_{i,t}$ is market capitalization; $CAPEX_{i,t}$ is the firms' capital expenditures; $TSO_{i,t+1}$ denotes total outstanding stock options at year t+1.

The following regression which is used to check the relationship between an actual repurchase and stock options held by executives and non-executives is as follows:

$$REPUR_{i,t} = \alpha_0 + \alpha_1 FCF_{i,t} + \alpha_2 Debt_{i,t} + \alpha_3 MTB_{i,t} + \alpha_4 Div_{i,t} + \alpha_5 Size_{i,t} + \alpha_6 CAPEX_{i,t} + \alpha_7 EXSO_{i,t+1} + \alpha_8 EMSO_{i,t+1} + \varepsilon_{i,t} \quad (2)$$

where $EXSO_{i,t+1}$ represents total outstanding executive options at year t+1; $EMSO_{i,t+1}$ denotes total outstanding non-executive options at year t+1.

The regression below examines if exercisable and unexercisable executive options affect an actual repurchase.

$$REPUR_{i,t} = \alpha_0 + \alpha_1 FCF_{i,t} + \alpha_2 Debt_{i,t} + \alpha_3 MTB_{i,t} + \alpha_4 Div_{i,t} + \alpha_5 Size_{i,t} + \alpha_6 CAPEX_{i,t} + \alpha_7 EXSOE_{i,t+1} + \alpha_8 EXSOU_{i,t+1} + \varepsilon_{i,t} \quad (3)$$

where $EXSOE_{i, t+1}$ is exercisable executive options at year t+1; $EXSOU_{i, t+1}$ denotes unexercisable executive options at year t+1.

3.4. Data and event day selection

In order to examine the relationship between ESOs and repurchases, we investigate 1042 listed companies that were repurchased from Aug. 9th 2000 to Dec. 31st 2005. Financial data was gathered by the Taiwan Economic Journal (TEJ).

This study defines the day the board of directors decided to repurchase at the announcement as the event day, which is shown as day 0. According to H2 and H4, we use daily return to examine the short-run return for an announcement, and the event period separately includes 20 days prior to and following the event. Therefore, the event period includes 41 days.

According to H3 and H5, we use monthly return to examine the long-run return for an announcement, and the event period individually includes 5 months prior to and 24 months posterior to the event. Hence, the event period includes 30 months. Daily return is used to examine the short-run return for an announcement, and the estimation period continues for 160 days, which is from 180 days to 21 days prior to the event. Monthly return is used to examine the long-run return for an announcement, and the estimation period continues for 24 months, which is from 29 months to 6 months prior to the event.

4. Results

4.1. Descriptive statistics

Table 1 provides summary statistics of factors in actual repurchases. In the coefficients of REPUR, the mean 15.253 is very close to the median 15.240, and which means almost a symmetry distribution. But the big difference between the maximum and the minimum shows that there can be wild variations in shares actually repurchased because of the different payout policies that are made. As for the coefficients of FCF, its standard deviation is 0.049 and there is a slight variation among those sample firms.

In terms of debt ratios, there is a large gap between the maximum and the minimum, which means the operations of leverage financing of each firm are totally different. Moreover, the market-to-book asset ratios (MTB) show that some firms which have been repurchased are undervalued. From the gap between the maximum and minimum of the MTB, it is shown that there is a big variation in the undervaluation among stock prices of these firms. As for cash dividends, the mean is smaller than the median of Div, so its distribution is skewed to the left. Besides, the minimum 0 and the maximum 17.655 also show that some firms did not issue cash dividends while others issued a lot.

Speaking of firm sizes, because the range is small and the mean is close to the median, the distribution of size is almost symmetric. The standard deviation of CAPEX is 0.058. This means that the difference in growth opportunities between firms is slight. In addition, from other option variables' values (TSO, EXSO, EMSO, EXSOE, EXSOU), we know that there is a huge gap among the volume of ESOs issued by each firm.

[Insert table 1 here]

4.2. Analysis of correlation coefficients

Table 2 provides the values of all variables' correlation coefficients. The repurchasing size is negatively related to free cash flow (r=-0.198), and shares repurchased have a highly positive relationship with the firm size (r=0.554). In other words, the larger the firm size is, the more shares are repurchased. Besides, the shares repurchased have significantly positive relationships with total outstanding stock options in the next year, executive stock options, non-executive stock options, exercisable executive stock options, unexercisable executive stock options (r = 0.613, 0.350, 0.464, 0.177, 0.193). That is to say the more outstanding stock options there are, the more shares are repurchased.

[Insert table 2 here]

4.3. The influence of employee stock options on actual repurchases

Table 3 provides firm characteristics and the empirical results of regression

analysis. Here we use OLS methodology to perform hypotheses testing for H1.

As stated on table 3, the coefficients of FCF under the three regression models are separately -2.348, -4.339, and -5.641, and it shows that free cash flow unexpectedly has a negative relationship with the actual repurchasing size. On the basis of the calculation of free cash flow in this study, the empirical study does not support it because there is no positive relationship between shares repurchased and free cash flow and the amount of free cash flow does not have a knock-on effect on the real repurchasing size.

The coefficients of the debt ratio in the three regression models are -0.024, -0.030, and -0.036, which means the leverage level is significantly and negatively correlated with repurchasing size as expected. As demonstrated by Kahle (2002), the debt ratios of firms with repurchases are smaller than firms with increasing dividends. In other words, high-leverage firms repurchase fewer shares because they have to afford higher financing costs.

The undervaluation of stock prices can be shown by the coefficients of market-to-book asset ratios in the three regression models: -0.706, -0.617, and -0.609. Additionally, it is shown that the undervaluation level of stock prices has a significantly negative relationship with the actual shares repurchases as expected. It also means that when firm value is seriously undervalued, it is more possible for firms to repurchase in order to raise their stock price and firm value. This empirical result explains that the undervaluation of firm value can be an important motive to repurchase for listed companies.

Based upon previous studies, if cash dividends are less, more shares would be repurchased. However, through the coefficients (0.031, 0.016, and 0.009) of cash dividends for common stocks, it is known that issuing cash dividends is positively correlated with the repurchasing size but is not statistically significant.

With respect to the firm size, since the coefficients of firm sizes are individually 0.534, 0.741, and 0.853, there is a significantly positive correlation between firm size and the repurchasing size. That is to say, because large firms have lower financing costs, more stable cash flow and less information asymmetry, they can feed back a lot to their stockholders through a big repurchase. The empirical results in this study are

also the same as Dittmar (2000) and Kahle (2002), we find that large firms absolutely repurchase more shares.

In this study, we use capital expenditure as the estimation of growth opportunities. From the coefficients of CAPEX: 1.483, 1.562, and 1.797, the growth opportunities in the same year have an unexpectedly positive relationship with the repurchasing size. This is perhaps because ESOs are popular with Taiwan's electric enterprises with a high growth rate, and sometimes when executives own a large amount of stock options, they will tend to repurchase instead of investing in risky projects to increase stock prices because they've become conservative. Ergo, firms with high-growth rates will prefer to repurchase shares instead. However, the coefficients are not at a statistically significant level, so the result does not support that companies with less growth opportunities would have larger repurchase.

H1a says that when there are more total outstanding stock options in the next year, the more shares will be repurchased. The coefficient of TSO at the first regression 0.384 shows that total outstanding stock options in next year have a significantly positive relationship with the repurchasing size. When a firm has more outstanding stock options in the next year, in order to avoid dilution effect when options are exercised, the firm would usually repurchase more shares in this year. Hence, the empirical result supports H1a.

After total outstanding stock options in the next year (TSO) are divided into two groups-executive options (EXSO) and non-executive options (EMSO), regression 2 examines their influence on the repurchase. The empirical results show that only executive options are significantly related and mean that as the option-funding hypothesis says, when executives hold stock options, they will repurchase shares this year in advance to avoid dilution effects and option value decreasing when options are exercised next year. On the other hand, Lambert (1989) demonstrated that dividends would decrease with the adoption of employee stock options plan, while option value would decrease with dividends issued but the increase in shares repurchased would compensate option holders for their damage. Although in Taiwan, strike prices of employee stock options can be adjusted if the dividends are issued, managers still prefer to repurchase as it can raise the stock price. Therefore, the empirical result supports H1b.

Because the coefficient of non-executive options in the next year 0.100 is not yet statistically significant, this means that compared with executive options, non-executive options do not have explanatory power on the repurchase, and the self-interest of executives can also be shown. Hence, H1c is not supported.

As the knock-on effect of executive options in the next year on the repurchase has been proved in H1b, executive options are separated into exercisable (EXSOE) and unexercisable (EXSOU) executive options in regression 3 to be investigated individually. The coefficients of EXSOE and EXSOU, which are 0.040 and 0.033, are both significantly correlated with shares repurchased, and we can know that if there are more exercisable executive options in the next year, managers would more eager to repurchase shares because exercisable executive options in the next year are more influential than unexercisable ones. However, there is only a slight difference between the above coefficients, it shows that no matter whether the options held by managers are exercisable or unexercisable, managers would still repurchase shares out of self interest, so H1d and H1e are both supported.

[Insert table 3 here]

4.4. Empirical results analysis of short-term abnormal returns

Before employee stock options are issued, the average short-term abnormal announcement returns are shown in table 4. Except at t=-7, the abnormal announcement returns are negative in the 20 days prior to the event, where they are significantly negative when t is from -12 to -2 except t=-7, -9. This means that the stock price is undervalued prior to the announcement, and the market does not react to the announcement in advance. Besides, the average abnormal return turns out to be positive from the announcement day and continue for 11 days. Apparently, the average returns being significantly positive from t=1 to t=7 shows the market positive reaction to the repurchasing announcement event. As table 5 shows, before the announcement day, the stock price is undervalued because the cumulative abnormal returns for 5 days are significantly negative -1.4637 and turn out to be positive until t=20 after the announcement event.

[Insert table 4, 5 here]

From figure 1, it is seen that before employee stock option issues, the short-run cumulative abnormal return starts to increase from the event day, and it is up to 3.3362% at the twentieth day. In other words, repurchasing definitely has an announcement effect in the short term.

Table 6 offers the average short-term abnormal returns after executive stock option plans. Table 6 shows that from t=-12 to t=-1 the average return is significantly negative, which means that before the event day, the stock price is undervalued and there is no anticipatory market reaction to the repurchase. Positive abnormal returns appear from t=1 to t=5, and it assures the announcement effect occurs within a short time of the announcement. Further, cumulative abnormal returns are analyzed as table 7, and they are still significantly negative during the period from t=-5 to t=-1, then remain positive until t=20, after the repurchasing announcement. Moreover, as shown in figure 1, after options are issued, the cumulative short-term abnormal returns keep falling to the lowest on the event day and then rises up from the bottom, while the degree of stock price increasing is smaller than it was before executive stock option issues.

[Insert figure 1, table 6, table 7 here]

From figure 1, we also know that before options were issued, the short-run announcement effect is stronger than after that. This means that when employee stock option plans are not yet adopted, the positive market reaction to the event of a repurchase announcement reflecting the message of undervaluation is stronger. In addition, this is because when there are employee stock option plans, a part of the motive to repurchase shares is to offer the exercise, hence, the market reaction is weaker, and this is just as expected in H1. However, consistent with the signal theory by Ikenberry et al. (1995; 2000) and Chan et al. (2004), from table 4, table 6, and figure 1, the announcement effect can be revealed by the short-run market significantly positive reaction to repurchases no matter whether it occurs before or after employee stock option plans. Therefore, the empirical results support H2 and H4.

4.5. Empirical results analysis of long-term abnormal returns

Before issuing ESOs, the average long-term abnormal returns of the announcement of repurchases are as shown as table 8. In the three months prior to the event, where t=-1, -2, -3, the average long-term abnormal returns are negative. Until the month of t=0, it becomes significantly positive. That is to say, before repurchasing, the stock price is undervalued and the news of the repurchase is not leaked in advance because of no market reaction. Besides, significantly positive abnormal returns continue from the month of t=0 to t=6, and which shows the announcement effect can last for 6 months and it apparently causes a positive market reaction.

[Insert table 8 here]

Further, table 9 provides CAR values, and before the announcement event, the stock price is undervalued for the CAR is constantly negative and reverses to be significantly positive following the month of t=0 to t=24. From figure 2, the long-term CAR shows positive of t=0 till t=24 before issuing ESOs.

[Insert table 9, figure 2 here]

The long-term abnormal returns of a repurchase after issuing ESOs are shown in table 10. There are always significantly negative AR values in the two months prior to and at the announcement day, and it turns out to yield significantly positive abnormal returns at the month of t=1. Therefore, the stock price remains undervalued before the announcement. However, the significantly positive abnormal return only lasts for one month. In other words, after issuing ESOs, the announcement effect of a repurchase only appears in the short run but not significantly in the long run.

Analysis of cumulative abnormal returns is shown in table 11. From the month of t=-5 to t=-1, the cumulative abnormal returns are significantly negative. The insignificant positive CAR occurs for two month after the announcement day, it even shows to be significantly negative CAR after the event for 24 months.

[Insert table 10, table 11 here]

Moreover, as figure 2 shows, the long-term CAR values drops to the bottom at the announcement day and then rises by a small amount for a short while, but starts to go down again afterwards. This means that there are no positive abnormal returns

from the announcement in the long run after issuing ESOs.

To sum up, in comparison with the abnormal returns of the announcement before and after issuing stock options, both of them are close and their stock prices are undervalued. Furthermore, at figure 2, before issuing ESOs, the announcement effect can be seen because the stock price keeps increasing until the 24th month. Consistent with Ikenberry et al. (1995), this means that there is a long-term positive abnormal return from repurchase. Therefore, H3 is supported. Nevertheless, the long-term CAR does not obviously increase after issuing ESOs, and it may result from the fact that the purpose of a repurchase is mainly for the exercise of options by employees, not for raising the stock price. Thus, the empirical results support H5.

5. Conclusion

In Taiwan, the repurchase system and employee stock option plans have been maturing. From the empirical results made these years, the motive for a buyback would differ because of firms' financial situation and operation strategies. Especially since 2001, employee stock options have been issued expansively, and this has had a significant influence on the decision to repurchase gradually. In this study, the results show that when the debt ratio is lower, the undervaluation of stock prices is more serious, the firm size is larger, and the amount repurchased will be bigger. On the other hand, with the popularity of stock options, the amount repurchased will also increase out of executives' self interest and avoid any dilution effects if there are a greater amount of total outstanding stock options in the next year, executive options held in the next year and exercisable and unexercisable executive options.

Previous studies attribute the market reaction of the repurchase to the signal theory-the purpose of a buyback is to convey the message of undervaluation to raise the stock price up. However, we find that the motives to repurchase includes offering shares for the exercise of employee stock options after 2001, when employee stock options were first issued in Taiwan. Therefore, this study examines the announcement effects separately before and after issuing ESOs. The empirical results show that no matter in the short run or in the long run, consistent with the signal theory, the announcement of a buyback can bring positive abnormal returns if ESOs are not

issued yet, while the long-term positive abnormal return disappears after options are issued. In other words, the importance of the signal theory is replaced by the option-funding hypothesis.

Finally, we suggest further studies to classify the samples according to their industry, and make hypotheses from industry characteristics to obtain more detailed information.

References

Bartov, E., Krinsky, I., Lee, J., "Evidence on how companies choose between dividends and open-market stock repurchases," *Journal of Applied Corporate Finance* 11, 1998, pp. 89-96.

Bens, D., Nagar, V., Skinner, D. Wong, M.H., "Employee stock options, EPS dilution, and stock repurchases, "*Journal of Accounting and Economics* 36, 2003, pp. 51-90.

Brav, A., Graham, J., Harvey, C., Michaely, R., "Payout policy in the 21st century," *Journal of Financial Economics* 77, 2005, pp. 483-527.

Chan, K., Ikenberry, D., Lee, I., "Economic Sources of Gain in Stock Repurchases," *Journal of Financial and Quantitative Analysis* 39, 2004, pp. 461-479.

Dann, L., "Common stock repurchase: An analysis of returns to bondholders and stockholders", *Journal of Financial Economics* 9, 1981, pp. 113-138.

Dittmar, A. K., "Why do firms repurchase stock?" *Journal of Business* 73, 2000, pp. 331-355.

Dunsby, A., "Share repurchases, dividends, and corporate distribution policy," Working paper, Philadelphia: The Warton School, 1994.

Evans, J., Evans, R., Gentry, J., "The decision to repurchase shares: a cash flow story," *Journal of Business and Management* 2, 2003, pp. 99-123.

Fenn, G.W., Liang, N., "Corporate payout policy and managerial stock incentives", *Journal of Financial Economics* 60, 2001, pp. 45-72.

Guay, W., Harford, J., “The cash-flow permanence and information content of dividend increases versus repurchases”, *Journal of Financial Economics* 57, 2000, pp. 385-416.

Ikenberry, D., Lakonishok, J., Vermaelen, T., “Market underreaction to open market share repurchases,” *Journal of Financial Economics* 39, 1995, pp. 181-208.

Ikenberry, D., Lakonishok, J., Vermalen, T., “Stock repurchase in Canada: performance and strategic trading,” *Journal of Finance* 55, 2000, pp. 2373-2397.

Ikenberry, D., Vermaelen, T., “The option to repurchase stock,” *Financial Management* 25, 1996, pp. 9-24.

Jagannathan, M., Stephens, C., “Motives for multiple open-market repurchase programs,” *Financial Management* 32, 2003, pp. 71-91.

Jensen, M. C., “Agency costs of free cash flow, corporate finance, and takeovers,” *American Economic Review* 76, 1986, pp. 323-329.

Jolls, C., “Stock repurchases and incentive compensation,” Unpublished working paper. NBER, 1998.

Kahle, K., “When a buyback isn’t a buyback: open market repurchases and employee options”, *Journal of Financial Economics* 63, 2002, pp. 235- 261.

Lakonishok, J., Vermaelen, T., “Anomalous price behavior around repurchase tender offers,” *Journal of Finance* 45, 1990, pp. 455-477.

Lambert, R., “Income smoothing as rational equilibrium behavior”, *Accounting Review* 59, 1989, pp. 604-618.

Lehn, K., Poulsen, A., “Free cash flow and stockholder gains to going private transactions,” *Journal of Finance* 44, 1989, pp. 771-787.

Nohel, T., Tarhan, V., “Share repurchases and firm performance：new evidence on the agency costs of free cash flow,” *Journal of Financial Economics* 49, 1998, pp. 187-222.

Vermaelen, T., “Common stock repurchase and market signaling: an empirical study,” *Journal of Financial Economics* 9, 1981, pp. 139-183.

Weisbenner, S., “Corporate share repurchases in the 1990s: What role do stock options play?” Unpublished working paper, Federal Reserve Board, 2000.

Table 1 Descriptive statistics

	Min.	Max.	Mean	Median	Std Dev
REPUR	9.547	19.271	15.253	15.240	1.656
FCF	-0.211	0.121	0.014	0.017	0.049
Debt	0.066	0.659	0.393	0.406	0.139
MTB	0.650	3.295	1.544	1.474	0.442
Div	0.000	17.655	7.070	11.075	6.022
Size	13.226	19.360	15.644	15.578	1.188
CAPEX	-1.226	0.327	0.002	-0.001	0.058
TSO	11.156	20.869	16.283	15.887	1.572
EXSO	0.000	17.170	9.733	13.122	6.616
EMSO	0.000	20.852	16.093	15.722	2.055
EXSOE	0.000	16.811	4.785	0.000	6.616
EXSOU	0.000	17.170	6.894	0.000	7.041

Notes: The dependent variable REPUR is equal to shares on actual repurchases, defined as log of shares on repurchases. FCF is calculated as in Lehn and Poulsen (1989). Debt is calculated as total debt divided by total assets. MTB is calculated as market equity plus long-term debt plus debt incurrent liabilities, divided by the book value of total assets. Div is calculated as the log of cash dividends. Size is calculated as log of sales. CAPEX is calculated as the fixed assets on the year minus the fixed assets before the year, divided by the total assets. TSO is calculated as the total options outstanding (year +1), divided by the shares outstanding. EXSO is calculated as executive options outstanding (year +1), divided by the shares outstanding. EMSO is calculated as non-executive options outstanding (year +1), divided by the shares outstanding. EXSOE is calculated as exercisable executive options (year +1), divided by the shares outstanding. EXSOU is calculated as unexercisable executive options (year +1), divided by the shares outstanding.

Table 2 Pearson correlation with the repurchase factor

	REPUR	FCF	Debt	MTB	Div	Size	CAPEX	TSO	EXSO	EMSO	EXSOE	EXSOU
REPUR	–	-0.198* (0.018)	-0.113 (0.179)	-0.115 (0.171)	-0.056 (0.503)	0.544** (0.000)	-0.035 (0.675)	0.613** (0.000)	0.350** (0.000)	0.464** (0.000)	0.177* (0.034)	0.193* (0.000)
FCF		–	-0.192* (0.022)	0.224* (0.007)	0.292* (0.000)	-0.141 (0.092)	-0.221* (0.008)	-0.334** (0.000)	-0.070 (0.404)	-0.261** (0.002	0.124 (0.141)	-0.164 (0.051)
Debt			–	-0.034 (0.687)	-0.101 (0.230)	0.260** (0.002)	0.026 (0.754)	-0.050 (0.550)	-0.080 (0.344)	-0.016 (0.848)	-0.027 (0.748)	-0.018 (0.832)
MTB				–	0.204* (0.015)	0.138 (0.100)	0.170* (0.043)	-0.012 (0.891)	-0.148 (0.077)	0.027 (0.751)	-0.130 (0.123)	-0.068 (0.422)
Div					–	-0.074 (0.378)	0.150 (0.073)	-0.312** (0.000)	-0.039 (0.647)	-0.279** (0.001)	0.104 (0.216)	-0.163 (0.052)
Size						–	-0.054 (0.523)	0.664** (0.000)	0.122 (0.146)	0.539** (0.000)	0.033 (0.694)	0.077 (0.358)
CAPEX							–	-0.089 (0.292)	-0.011 (0.892)	-0.057 (0.495)	0.033 (0.694)	0.077 (0.358)
TSO								–	0.351** (0.000)	0.896** (0.000)	0.061 (0.467)	0.276** (0.001)
EXSO									–	0.206* (0.014)	0.465** (0.000)	0.625** (0.000)
EMSO										–	0.039 (0.643)	0.143 (0.088)
EXSOE											–	-0.160 (0.057)
EXSOU												–

Notes: *, **denotes statistical significance at the 10% and 5% levels respectively.

Table 3 Determinants of the level of actual repurchases

	Regression 1	Regression 2	Regression 3
Intercept	2.492* (0.087)	3.269*** (0.010)	3.287*** (0.008)
FCF	-2.348 (0.380)	-4.339* (0.094)	-5.641** (0.031)
Debt	-0.024*** (0.006)	-0.030*** (0.000)	-0.036*** (0.000)
MTB	-0.706*** (0.005)	-0.617** (0.015)	-0.609** (0.019)
Div	0.031 (0.103)	0.016 (0.384)	0.009 (0.623)
Size	0.534*** (0.000)	0.741*** (0.000)	0.853*** (0.000)
CAPEX	1.483 (0.425)	1.562 (0.400)	1.797 (0.341)
TSO	0.384*** (0.000)	—	—
EXSO	—	0.052*** (0.002)	—
EMSO	—	0.100 (0.128)	—
EXSOE	—	—	0.040** (0.016)
EXSOU	—	—	0.033** (0.033)
Adjusted R^2	0.454	0.455	0.436
F value	17.852*** (0.000)	15.843*** (0.000)	14.708*** (0.000)

Notes: The dependent variable REPUR is equal to shares on actual repurchases, defined as log of shares on repurchases. FCF is calculated as in Lehn and Poulsen (1989). Debt is calculated as total debt divided by total assets. MTB is calculated as market equity plus long-term debt plus debt incurrent liabilities, divided by the book value of total assets. Div is calculated as the log of cash dividends. Size is calculated as log of sales. CAPEX is calculated as the fixed assets on the year minus the fixed assets before the year, divided by the total assets. TSO is calculated as the total options outstanding (year +1), divided by the shares outstanding. EXSO is calculated as executive options outstanding (year +1), divided by the shares outstanding. EMSO is calculated as non-executive options outstanding (year +1), divided by the shares outstanding. EXSOE is calculated as exercisable executive options (year +1), divided by the shares outstanding. EXSOU is calculated as unexercisable executive options (year +1), divided by the shares outstanding. The number in parentheses is the p value. *, **, ***denotes statistical significance at the 10%, 5% and 1% levels respectively.

Table 4 Short-term abnormal returns before executive stock option plans

daily	AR	$t_{(AR)}$	daily	AR	$t_{(AR)}$
-20	-0.1289	-1.0799	1	1.5278	11.2545***
-19	-0.123	-1.0627	2	1.2114	8.5062***
-18	-0.0661	-0.5451	3	0.8546	6.2947***
-17	-0.2119	-1.8063*	4	0.5138	4.029***
-16	-0.1385	-1.2281	5	0.3218	2.4917**
-15	-0.1621	-1.4087	6	0.3855	3.116***
-14	-0.1141	-0.8661	7	0.257	2.186**
-13	-0.0558	-0.4779	8	0.0734	0.5824
-12	-0.2863	-2.4359**	9	0.1824	1.5545
-11	-0.2864	-2.5462**	10	0.0831	0.701
-10	-0.2417	-1.9148*	11	-0.1851	-1.5705
-9	-0.0626	-0.5224	12	0.2501	2.244**
-8	-0.251	-2.137**	13	0.1869	1.581
-7	0.1378	1.0732	14	0.0381	0.3329
-6	-0.3622	-3.0086***	15	0.1193	0.9999
-5	-0.4345	-3.6651***	16	0.3118	2.7839***
-4	-0.3934	-3.0757***	17	0.1484	1.2001
-3	-0.2275	-1.7563*	18	0.3284	2.595***
-2	-0.2819	-2.1369**	19	0.3949	3.54***
-1	-0.1265	-0.9096	20	0.1249	1.0604
0	0.2154	1.491			

Notes: We provide the result for an event-study of the short-term price reaction of repurchase before executive stock option plans. We use the day as a unit of short-term measurement. Our calculations follow a market model approach. *, **, ***denotes statistical significance at the 10%, 5% and 1% levels respectively.

Table 5 Short-term cumulative abnormal returns before executive stock option plans

daily	CAR	$t_{(CAR)}$	daily	CAR	$t_{(CAR)}$
0	0.2154	1.491	11	5.4412	10.1721***
1	1.7432	8.422***	12	5.6913	10.3032***
2	2.9546	10.8342***	13	5.8782	10.2539***
3	3.8092	11.6911***	14	5.9163	10.173***
4	4.323	11.6346***	15	6.0356	10.1082***
5	4.6448	11.4942***	16	6.3474	10.1403***
6	5.0303	11.9398***	17	6.4958	9.8968***
7	5.2873	11.8775***	18	6.8241	9.9493***
8	5.3608	11.3784***	19	7.219	10.2816***
9	5.5432	11.2964***	20	7.3439	10.3483***
10	5.6263	10.8933***			

Event window	CAR	$t_{(CAR)}$
(-5, -1)	-1.4637	-4.117***
(0, 2)	2.9546	10.8342***
(0, 20)	7.3439	10.3483***

Notes: We provide the result for an event-study of the short-term price reaction of repurchase before executive stock option plans. We use the day as a unit of short-term measurement. Our calculations follow a market model approach. *, **, ***denotes statistical significance at the 10%, 5% and 1% levels respectively. CAR(t1, t2) is the cumulative abnormal returns for each event windows.

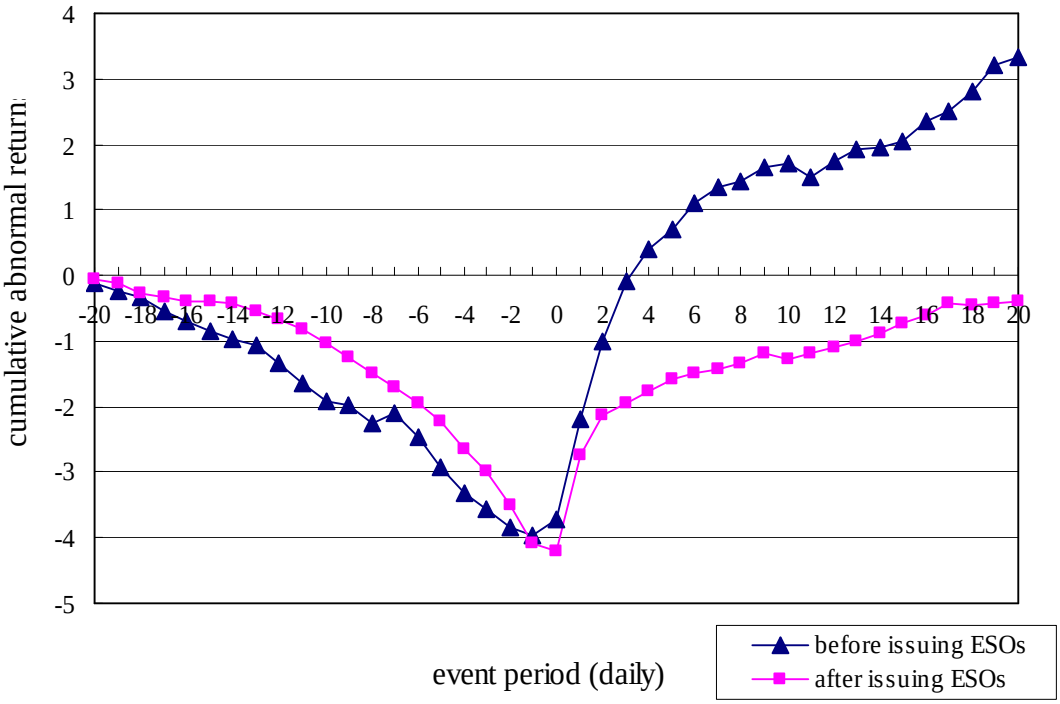

Figure 1 Short-term cumulative abnormal return before and after executive stock option plans

Notes: We calculate short-term cumulative abnormal returns for repurchase during the 20 trading days prior to and after a repurchase announcement (day 0). We use the day as a unit of short-term measurement. Our sample divided into before and after executive stock option plans.

Table 6 Short-term abnormal returns after executive stock option plans

daily	AR	$t_{(AR)}$	daily	AR	$t_{(AR)}$
-20	-0.0685	-0.9383	1	1.4483	14.8876***
-19	-0.0444	-0.6159	2	0.6008	7.519***
-18	-0.1469	-1.8979*	3	0.1969	2.4678**
-17	-0.062	-0.8316	4	0.2151	2.908***
-16	-0.0607	-0.8229	5	0.1782	2.2726**
-15	-0.0334	-0.4468	6	0.1003	1.4174
-14	-0.0335	-0.4752	7	0.0518	0.7074
-13	-0.1078	-1.4892	8	0.1119	1.5299
-12	-0.1217	-1.7714*	9	0.1375	1.9408*
-11	-0.1364	-1.7758*	10	-0.0745	-1.0564
-10	-0.2382	-3.4624***	11	0.0878	1.2564
-9	-0.206	-2.7672***	12	0.0856	1.235
-8	-0.2153	-3.0675***	13	0.08	1.121
-7	-0.2149	-3.0191***	14	0.1188	1.6198
-6	-0.2481	-3.2594***	15	0.1501	1.9503*
-5	-0.2659	-3.5186***	16	0.1595	2.1695**
-4	-0.4151	-5.3504***	17	0.1732	2.272**
-3	-0.3477	-4.2473***	18	-0.0389	-0.5535
-2	-0.5188	-6.2484***	19	0.0364	0.481
-1	-0.5442	-5.9899***	20	0.0485	0.6293
0	-0.1145	-1.2016			

Notes: We provide the result for an event-study of the short-term price reaction of repurchase after executive stock option plans. We use the day as a unit of short-term measurement. Our calculations follow a market model approach. *, **, ***denotes statistical significance at the 10%, 5% and 1% levels respectively.

Table 7 Short-term cumulative abnormal returns after executive stock option plans

daily	CAR	$t_{(CAR)}$	daily	CAR	$t_{(CAR)}$
0	-0.1145	-1.2016	11	2.9397	10.5669***
1	1.3338	9.5631***	12	3.0254	10.3346***
2	1.9347	11.8878***	13	3.1054	9.9991***
3	2.1316	11.618***	14	3.2241	9.921***
4	2.3467	11.9464***	15	3.3742	9.9456***
5	2.5249	11.8854***	16	3.5337	10.0211***
6	2.6252	11.7729***	17	3.7069	10.4344***
7	2.677	11.5881***	18	3.668	10.0322***
8	2.7889	11.428***	19	3.7044	9.7707***
9	2.9264	11.4229***	20	3.7528	9.4243***
10	2.8519	10.6067***			

Event window	CAR	$t_{(CAR)}$
(-5, -1)	-2.0917	-10.0052***
(0, 2)	1.9347	11.8878***
(0, 20)	3.7528	9.4243***

Notes: We provide the result for an event-study of the short-term price reaction of repurchase after executive stock option plans. We use the day as a unit of short-term measurement. Our calculations follow a market model approach. *, **, ***denotes statistical significance at the 10%, 5% and 1% levels respectively. CAR(t1, t2) is the cumulative abnormal returns for each event windows.

Table 8 Long-term abnormal returns before executive stock option plans

monthly	AR	$T_{(AR)}$	monthly	AR	$t_{(AR)}$
-5	-0.0656	-0.1132	10	3.4084	4.3878***
-4	0.2577	0.4035	11	2.6369	3.0131***
-3	-0.4599	-0.7147	12	0.6566	0.887
-2	-0.1912	-0.3072	13	1.9187	2.4265**
-1	-0.5053	-0.753	14	2.956	2.9695***
0	3.865	4.8669***	15	2.4003	3.0549***
1	3.9879	5.8979***	16	5.9972	5.4523***
2	2.3541	2.9812***	17	5.9876	5.8993***
3	3.1909	3.6397***	18	5.9915	5.5478***
4	4.3621	4.7419***	19	3.8762	5.42***
5	2.7311	3.5338***	20	3.6785	5.6216***
6	2.426	2.7939***	21	1.822	2.8218***
7	0.1371	0.2118	22	1.103	1.976**
8	2.1473	2.7752***	23	1.8686	2.6087***
9	3.8552	5.6969***	24	2.0449	3.5909***

Notes: We provide the result for an event-study of the long-term price reaction of repurchase before executive stock option plans. We use the month as a unit of long-term measurement. Our calculations follow a market model approach. *, **, ***denotes statistical significance at the 10%, 5% and 1% levels respectively.

Table 9 Long-term cumulative abnormal returns before executive stock option plans

monthly	CAR	$t_{(CAR)}$	monthly	CAR	$t_{(CAR)}$
0	3.865	4.8669***	13	37.6774	12.1675***
1	7.853	8.0225***	14	40.6334	12.2009***
2	10.2071	8.4456***	15	43.0337	12.5486***
3	13.3979	9.2447***	16	49.0309	13.344***
4	17.7601	10.3375***	17	55.0185	14.1133***
5	20.4912	10.9523***	18	61.0101	15.0613***
6	22.9172	11.2521***	19	64.8863	15.4091***
7	23.0543	10.7353***	20	68.5647	15.8881***
8	25.2016	10.8816***	21	70.3868	15.8055***
9	29.0568	11.7669***	22	71.4898	15.5997***
10	32.4652	12.4383***	23	73.3583	15.0682***
11	35.1021	12.1493***	24	75.4032	14.9765***
12	35.7587	11.9597***			

Event window	CAR	$t_{(CAR)}$
(-5, -1)	-1.0518	-0.6979
(0, 2)	10.2071	8.4456***
(0, 24)	75.4032	14.9765***

Notes: We provide the result for an event-study of the long-term price reaction of repurchase before executive stock option plans. We use the month as a unit of long-term measurement. Our calculations follow a market model approach. *, **, ***denotes statistical significance at the 10%, 5% and 1% levels respectively. CAR(t_1, t_2) is the cumulative abnormal returns for each event windows.

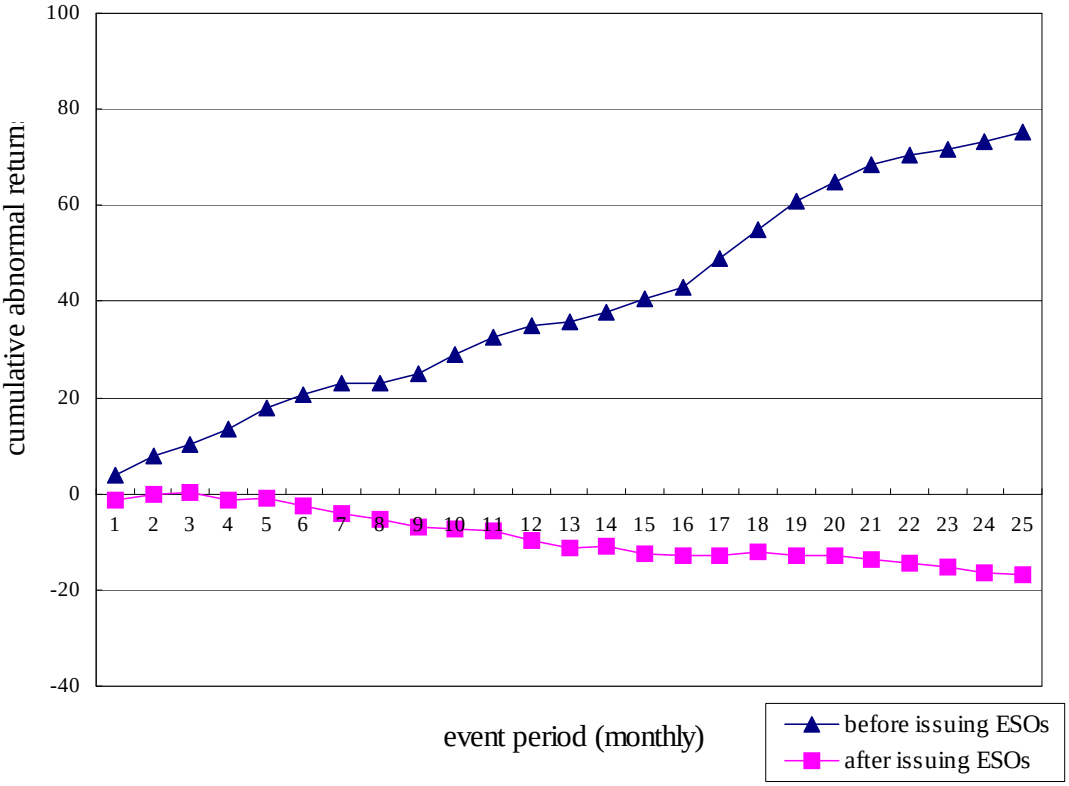

Figure 2 Long-term cumulative abnormal returns before and after executive stock option plans

Notes: We calculate long-term cumulative abnormal returns for repurchase during the 24 trading months after a repurchase announcement (month 0). We use the month as a unit of long-term measurement. Our sample divided into before and after executive stock option plans.

Table 10 Long-term abnormal returns after executive stock option plans

monthly	AR	$t_{(AR)}$	monthly	AR	$t_{(AR)}$
-5	1.3143	1.7569*	10	-0.599	-1.0773
-4	0.323	0.5458	11	-1.9013	-3.8059***
-3	-0.799	-1.4912	12	-1.495	-2.7629***
-2	-1.0678	-1.622	13	0.2224	0.4158
-1	-1.316	-2.0076**	14	-1.4524	-3.0629***
0	-1.3259	-2.6084***	15	-0.5076	-0.9757
1	1.4018	2.4836**	16	0.2555	0.5
2	0.3403	0.5226	17	0.8095	1.4778
3	-1.9093	-3.5413***	18	-1.0256	-1.8491*
4	0.4566	0.722	19	0.0751	0.1322
5	-1.62	-3.1265***	20	-0.6661	-1.3909
6	-1.3722	-2.3078**	21	-1.078	-2.042**
7	-1.2973	-2.556**	22	-0.711	-1.3729
8	-1.5759	-3.6979***	23	-1.1763	-2.2021**
9	-0.3712	-0.7607	24	-0.4969	-0.9506

Notes: We provide the result for an event-study of the long-term price reaction of repurchase after executive stock option plans. We use the month as a unit of long-term measurement. Our calculations follow a market model approach. We provide test statistics for two-tailed t test. *, **, ***denotes statistical significance at the 10%, 5% and 1% levels respectively.

Table 11 Long-term cumulative abnormal returns after executive stock option plans

monthly	CAR	$t_{(CAR)}$	monthly	CAR	$t_{(CAR)}$
0	-1.3259	-2.6084***	13	-11.0459	-4.046***
1	0.076	0.0982	14	-12.4983	-4.3743***
2	0.4162	0.4167	15	-13.0058	-4.2934***
3	-1.4931	-1.2612	16	-12.7503	-3.969***
4	-1.0365	-0.7469	17	-11.9407	-3.5021***
5	-2.6565	-1.6978*	18	-12.9663	-3.6116***
6	-4.0286	-2.382**	19	-12.8912	-3.4248***
7	-5.326	-2.9393***	20	-13.5574	-3.4872***
8	-6.9019	-3.6438***	21	-14.6354	-3.6104***
9	-7.273	-3.492***	22	-15.3464	-3.6365***
10	-7.8721	-3.4872***	23	-16.5227	-3.7455***
11	-9.7734	-4.0602***	24	-17.0196	-3.7507***
12	-11.2683	-4.3212***			

Event window	CAR	$t_{(CAR)}$
(-5,-1)	-3.9958	-3.646***
(0, 2)	0.4162	0.4167
(0, 24)	-17.0196	-3.7507***

Notes: We provide the result for an event-study of the long-term price reaction of repurchase after executive stock option plans. We use the month as a unit of long-term measurement. Our calculations follow a market model approach. We provide test statistics for two-tailed t test. *, **, ***denotes statistical significance at the10%, 5% and 1% levels respectively.