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# Market Reaction to Actual

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## Abstract

The stock market reaction around the announcement date of actual share repurchases, the factors that affect the size of that reaction, and the motives behind share acquisitions are examined. A unique, hand-collected dataset is used, including public announcements of companies traded on the Athens Stock Exchange. Consistent with the price support hypothesis, companies repurchase when their share price exhibits a declining trend, whereas the short-term market reaction is not statistically significant. Large firms and firms with low book-to-market ratio repurchase when their stock has underperformed the market. Small firms and firms with high book-to-market ratio repurchase even though their shares have not experienced abnormal declines. The market reacts more favorably to buybacks by small firms and firms with high book-to-market ratio. Long-term abnormal returns are higher for repurchasing firms compared to non-repurchasing controls, and depend positively on the frequency of repurchases and the stated reason for program authorization.



***JEL Classification:*** G14, G15, G35

***Keywords:*** Actual share repurchases, market reaction, firm characteristics, stated repurchase reasons, price support hypothesis

## 1. Introduction

Several published studies examine the motives of firms behind open-market share repurchase programs (SRPs), especially in the USA. The most popular hypothesis is that SRPs are used by companies to send a signal to the market indicating that their stock is underpriced. A partial literature includes Dann (1981), Vermaelen (1981), Bartov (1991), Dann et al. (1991), Comment and Jarrell (1991), and Lie and McConnell (1998).[1] Company executives consider stock underpricing as one of the most important factors when deciding share repurchases (Brav et al., 2005, Mitchell et al., 2001) and there is evidence that they time the SRP announcements to exploit the potential undervaluation (Ikenberry et al., 1995). Separately from the signaling framework, Ikenberry and Vermaelen (1996) view SRPs as options to exchange the market value of the shares with their true value, thereby expanding the company's investment opportunity set.

Two basic questions that arise are, first, to what extend the managers possess the ability to detect any mispricing opportunities during the implementation of an SRP, and, second, whether investors perceive the firms' repurchases as a signal of undervaluation. Furthermore, there is a variety of value-adding choices such as market timing, price support and size of repurchases, which would be useful to presumably better-informed management (Cook et al., 2004). Market timing implies that the firm repurchases at a low price compared to the subsequent non-repurchase period (Ginglinger and Hamon, 2007). Price support implies that the firm repurchases in a contrarian fashion, thus, the stock price during the repurchases is lower than it is on prior periods but not significantly different from subsequent periods (Ginglinger and

[1] Alternative - and not necessarily mutually exclusive - motives also cited in the literature for repurchases in general are: dividend substitution (Grullon and Michaely, 2002), capital structure adjustment (Bonaimé et al., 2014, Lie, 2002), option exercise in stock option plans (Bens et al., 2003, Fenn and Liang, 2001, Kahle, 2002), agency costs of free cash-flow (Grullon and Michaely, 2004), and takeover defense (Denis, 1990).

Hamon, 2007). In the same spirit of adding value to the firm's shareholders, the size of repurchases enhances the strength of repurchases as signals to outside investors (Zhang, 2005).

The questions posed above are difficult to examine in the USA capital markets (Stephens and Weisbach, 1998), particularly due to the lack of timely data on actual share repurchases. Mitchell and Dharmawan (2007) report that stock buybacks in the USA do not have a standard structure, they lack typical procedures and are characterized by a relatively low degree of transparency, as they are not made public at the time they are conducted. Indeed, up to 2004, various USA studies were based either on estimates of the actual repurchases made (Stephens and Weisbach, 1998) or on questionnaires that some companies answered voluntarily (Cook et al., 2004). Beginning in 2004, companies were required to disclose the number of shares acquired each month and the average acquisition price per share. This information is released later, in the financial statements, and although such retroactive notifications increase transparency in the long run, investors are not informed immediately about the firm's most recent actions (Simkovik, 2009).

Some markets other than those of the USA, such as Australia, Canada and Hong Kong, have a more transparent repurchase framework in which companies are required to disclose the share repurchases made within a day. Studies that use daily data find, among other things, that the companies buy their own shares when the share prices are on a declining path, that the managers are capable to time the markets, and that firms acquire their shares at a price lower than the average investor does (Brockman and Chung, 2001, Zhang, 2005, McNally et al., 2006, Akyol and Foo, 2013).

The present study uses a unique database with hand-collected data from the Greek stock market, covering the period from August 2005 to December 2010. During this period, companies

were required to disclose publicly their daily transactions on share repurchases immediately. The Greek legal framework provides the required transaction transparency and its capital market a rich data volume (7,619 announcements of share repurchases are observed during the period under examination). This enables us to draw reliable conclusions about the repurchase activity on the part of firms and about the reaction on the part of investors, especially in a period of initially rising and eventually declining Greek equity market. Hence, our study contributes further evidence to the non-USA literature on actual daily share repurchases which is rather thin, consisting of a few notable papers on foreign markets such as Brockman and Chung (2001) and Zhang (2005) for Hong Kong, McNally et al. (2006) for Canada, Ginglinger and Hamon (2007) for France, and Akyol and Foo (2013) for Australia.

Regarding our findings, a general result is that different firms proceed to actual repurchases for different reasons and at different times, which is in line with the result of Dittmar (2000) for SRP announcements. Using the full set of announcements, we find that companies engage in buybacks when the stock price exhibits a declining trend, and that the short-term market reaction is not statistically significant, a result that is consistent with the price support hypothesis (Cook et al., 2004, Ginglinger and Hamon, 2007, Akyol and Foo, 2013, Zhang, 2005). However, when we focus on firm characteristics, we find that smaller firms and firms with a higher book-to-market ratio repurchase shares without having observed significant fluctuations in the period preceding the buybacks, while the short-term investor reaction is positive and statistically significant. In contrast, larger firms and firms with a lower book-to-market ratio repurchase shares after periods in which the stock price is in a declining course, and, after the share acquisitions, a price stabilization takes place. This result agrees with Zhang (2005).

Regarding repurchase characteristics, when there is a small number of announcements in a period of three months before the actual repurchase announcement, the CARs behave in accordance with the market timing hypothesis. When there is a short interval between announcements or when the percentage of shares bought back is low, the results confirm the price support hypothesis, and when the percentage of share bought back is high, the findings support the signaling undervaluation hypothesis.

The stated reason for authorizing an SRP is related to the stock behavior before and after the actual repurchase as follows: Firms which state the price support as a reason for approving an SRP when it's stock is considered underpriced, receive a positive reaction by the market when they proceed with the actual implementation of the SRP. Firms that avoid mentioning a specific reason for approving SRPs seem to use the stock buybacks as a means of stopping the declining trend of their share price. The stated-reason results are in the same spirit as in the paper of Akyol and Foo (2013), albeit not directly comparable due methodological differences.

In contrast to the literature of actual share buybacks, such as Zhang (2005) and Akyol and Foo (2013), we find a strong long-term abnormal return for firms that conduct repurchases. In addition, the long-run return of these firms is positively related to the frequency of actual repurchases and negatively related to book-to-market ratios.

The rest of the paper is organized as follows. The theoretical framework and the hypotheses to be tested are presented in the next section. Section 3 describes the data and the methodology. The empirical results are shown in Section 4, and Section 5 concludes the paper.

## 2. Theoretical background and development of hypotheses

### *2.1. The market timing hypothesis*

Market timing, or managerial timing ability, is a term that refers to the issuance of new shares by a company when its stock price is at high levels and the acquisition of own shares when the stock price is at low levels. The purpose of these company actions is to exploit the current stock price fluctuations for the benefit of the long-term investors. An obvious precondition is that the market should not be characterized by strong form efficiency (Baker and Wurgler, 2002).

A fundamental question related to stock buybacks is to what extend the executives use their private information to proceed with stock repurchases (Barclay and Smith, 1988). Brockman and Chung (2001) use daily data from the Hong Kong stock market and find that executives possess a market timing ability which depends on the market conditions and the special characteristics of the firm.

Using monthly data from Japan, Ishikawa and Takahashi (2011) find that firms acquire their own shares if their stock price has followed a declining trend during the previous month, and that the stock returns of firms actually repurchasing shares exceeds the market return during the ensuing months. The results support the notion that company executives do possess the private information and/or the ability to detect when the capital market has been driven by mispricing.

The market timing hypothesis implies that the market price of the stock will be lower during the dates of conducting share repurchases in comparison to the subsequent days (Ginglinger and Hamon, 2007). The recent study by De Cesari et al. (2012) for the USA finds that indeed the companies seem to possess the ability to time the market and succeed in acquiring their own shares at a relatively low price. In addition, they find that during the month before the

share acquisitions, the stock price follows a declining trend and a negative abnormal return is observed, whereas after the repurchase, a positive abnormal return is observed. The studies of Ben-Rephael et al. (2014) and Dittmar and Field (2015) also find results consistent with the market timing hypothesis.

**H1**: Negative abnormal returns are observed before the stock repurchases in the open market and positive abnormal returns are observed after the stock repurchases.

## *2.2. The price support hypothesis*

According to the price support hypothesis, share repurchases are conducted by a company to stem a declining trend in the stock price. The main difference with the market timing hypothesis is that, a stabilization of stock prices is expected after the share repurchase, whereas in the case of the market timing hypothesis, a positive abnormal return is expected.

Ginglinger and Hamon (2007) study the French market and find that companies proceed to stock buybacks following periods of declining stock prices, but they do not observe a significant price increase after the repurchase. The results are consistent with the price support hypothesis. Similar results are found by Cook et al. (2004) for the shares that are traded at the New York Stock Exchange.

**H2:** Negative abnormal returns are observed in the period before a stock repurchase occurs and no abnormal returns are observed during the period after the repurchase.

## *2.3. The signaling undervaluation hypothesis*

The signaling undervaluation hypothesis suggests that managers are using share repurchases to signal "their disagreement with how the market is pricing existing public information" (Grullon and Ikenberry, 2000).

The signaling undervaluation hypothesis distinguishes from the market timing hypothesis in that, for the period before the repurchase, the stock price is not necessarily on a declining path (the firm does not trade against the market).

In the studies of Zhang (2005) and Akyol and Foo (2013), even though the undervaluation hypothesis is not explicitly addressed, the results are in accordance with this hypothesis. Zhang (2005) finds that the market reaction is positive for small and firms with high book-to-market ratio, which are more likely to be underpriced. Akyol and Foo (2013) report that for firms that state undervaluation as the motive for initiating a share repurchase program, the price reaction is positive when those firms proceed to the actual buybacks. The abnormal return for the ten-day period before the repurchase is not statistically significant for the undervaluation motive firms.

**H3:** Firms repurchase even though the stock price is not following a specific trend and the market reacts positively to the repurchase announcements.

## *2.4. Company characteristics and repurchase behavior*

Several studies find that companies with different characteristics exhibit different behavior regarding share repurchase activities and the market reaction is also different.

Ikenberry et al. (1995) examine announcements of SRPs (irrespective of whether the shares were eventually bought back) and find that, in the short-run, the market reaction is more favorable to SRP announcements by companies of smaller size. Cook et al. (2004) use voluntarily

disclosed daily data, to find that the larger companies proceed to buybacks after periods in which the stock price exhibits a downward trend, whereas for the smaller companies no such result is observed. Jagannathan and Stephens (2003) argue that frequent repurchases are driven by different motives than infrequent buybacks.

**H4:** Companies with different characteristics repurchase their own shares under different conditions.

**H5:** The market reaction will be different, depending on the characteristics of the companies that conduct repurchases and the firms' repurchase behavior.

### *2.5. Stated reasons for approving stock repurchase programs*

Otchere and Ross (2002) examine a sample of announcements of SRPs for which the stated reason for their approval is share undervaluation. These announcements are treated as a positive signal by the investors, and the market reacts favorably for the companies that approve SRPs. Such reaction is smaller, although positive for rival companies in the same industry, a fact that is consistent with the undervaluation hypothesis.

Peyer and Vermaelen (2009) find that at the announcement of SRP approval, the market reaction is stronger for firms that state undervaluation as the motive for the approval. Akyol and Foo (2013) use daily data from Australia and conclude that for companies which announce as a reason for initiating an SRP the fact that the stock is underpriced, the investors reaction is positive and stronger compared to the companies that announce a different reason for SRP approval. This observation holds both for the announcement date of the SRPs and for the dates of the actual repurchases. In addition, companies which mention their stock underpricing as a reason for approving repurchases eventually buy back fewer shares in relation to companies which state a

different reason for SRP approval, while daily repurchases do not seem to occur as a response to the stock price trend.

**H6:** The stated reason for approving SRPs affects the market reaction at the time of actual share repurchases.

### *2.6. Long-term performance of repurchasing firms*

To examine whether managers successfully exploit stock undervaluation, Ikenberry et al. (1995, 2000) find that, after announcing SRP authorizations, firms exhibit strong abnormal long-term returns, and that this result is more pronounced in firms with higher book-to-market ratio. Regarding actual daily repurchases, Akyol and Foo (2013) and Zhang (2005) do not find significant long-term abnormal returns for repurchasing firms compared to a matching sample of non-repurchasing firms, although Zhang (2005) finds that firms with high book-to-market ratio perform better in the long term.

**H7:** Repurchasing firms perform better in the long-term than non-repurchasing firms.

## 3. Disclosure requirements and share repurchase data

In Greece, an open market SRP must be authorized by the shareholders' General Meeting. At the date of the authorization, the General Meeting defines the maximum number of shares that can be purchased, the duration of the SRP and the maximum and minimum price that can be paid. A firm may repurchase up to 10% of the outstanding shares, and certain conditions for trading are imposed: At the date of the actual buyback, the repurchase price cannot be higher than the price of the last trade or the highest current bid. The company cannot repurchase more than 25% of the average daily volume of the shares. The average daily volume figure is based either on the

daily volume traded in the month preceding the month of public disclosure of that program, or the daily volume traded in the 20 trading days preceding the date of purchase. In cases of extremely low liquidity, a firm may repurchase up to 50% of the average daily volume, provided that both the stock market authority and the investors are informed in advance, as per European Regulation No. 2273/2003.

From 2007, the maximum duration of the programs changed from twelve to twenty-four months. The key information about the repurchase programs that is available to the investors in the program announcement includes: the date of the general meeting, the maximum number of shares to be repurchased, the duration of the program, and the reason for initiating a repurchase program, as stated by the company at the date of the SRP authorization (Drousia et al., 2017).

Until 2005, companies disclosed their repurchase activity over irregular intervals spanning from a few months to a whole year. Starting from 2005, when the Directive 2003/6/EU was implemented with the Greek Law 3340/2005, the daily repurchase activity of the firms had to be posted on the Daily Official List of the Athens Stock Exchange immediately. The key available information about the companies' daily repurchase activity includes the date of the actual repurchase, the date of the announcement of the repurchase, the number of repurchased shares and the average share price paid.

Capitalizing on this transparency of the Greek stock market, we construct a unique, hand-collected dataset including public announcements of companies whose stocks trade on the Athens Stock Exchange. The data concerning the repurchase programs and the daily open market repurchase activity are hand-collected from the *Daily Official List* of the Athens Stock Exchange. The rest of the data such as stock price, book-to-market ratio and firm size (market value of equity) are obtained from Thomson Reuters DataStream and Thomson Reuters WorldScope.

Table 1 reports the share repurchase activity in Greece from August 2005 to December 2010. We obtain 7,619 announcements of actual share repurchases, made by 74 firms under 120 program authorizations. The repurchase dates are 9,664. A factor that differentiates the present paper from other studies about actual share repurchases is that the number of the announcements and the number of repurchase days do not coincide (Panel A).

To include an announcement in the study, we require that the number of shares that are bought and the average price are reported daily. Several announcements are excluded because: i) the company had preferred shares as well as common shares at the date of the SRP authorization; ii) they contained buybacks for two to seven days but did not report the number of shares or the average price for every day separately, and iii) they were made later (not immediately) and is considered very likely that investors had already been informed by another source, such as the Internet or a newspaper. Other reasons for excluding announcements are repetition of the purchase date and incomplete information. To eliminate extreme observations, announcements that contained buybacks for more than seven trading days or are made after a reverse split (which changed significantly the number and the price of the company's traded shares) are not included in the study. Panel B of Table 1 reports in detail the number of announcements that are excluded. The final dataset includes 7,463 announcements of actual share repurchases, made by 69 firms under 109 program authorizations (Panel C).

The aim of this study is to examine the price performance surrounding the announcements of actual share repurchases as well as long-term. It is obvious that the number of announcements is quite large for the study period. In Panel D, we observe that most firms (53%) made more than fifty announcements. The percentage of firms that announced more than a hundred daily transactions is 33%. Throughout the period under consideration two firms made

only one announcement, while one firm made 558 announcements. To avoid undue weighting of firms and clustering problems we follow the approach of Zhang (2005), that is, when a firm makes multiple repurchase announcements within the month, only the first announcement is included in the final sample.

(Insert **Table 1** here)

Panel A of Table 2 reports descriptive statistics for the 826 announcements of the final sample. Quartile rankings are determined relative to all firms that are listed on the Athens Stock Exchange (ASE) on the day of the actual share buyback announcement. Small firms and firms with higher book-to-market ratio (B/M) have made less repurchase announcements, while larger firms report more repurchase days during the study period. In 2008, the number of repurchase announcements almost tripled from the previous year, as the stock exchange index dropped to lower levels following the onset of the global financial crisis. Panel B of Table 2 reports the number of trading days per announcement. The announcements that report more than one repurchase day are about 23.5% of the dataset. We proceed with the estimation of the short-term market reaction surrounding the actual share repurchase announcements.

(Insert **Table 2** here)

## 4. Empirical evidence

### *4.1. Short-term share price performance*

We use the standard event study methodology to estimate the cumulative abnormal return (CAR) around the announcements of actual daily share repurchases. The market model is used as the benchmark model, with an estimation period ranging from 200 to 21 days before the announcement (−200, −21) and an event window that starts 20 trading days before the date of

the announcement and ends 20 days after the announcement (−20, +20). The market returns are based on the General Index of the Athens Stock Exchange. Day "0" is the day of the announcement at the *Daily Official List* of the Athens Stock Exchange. To determine statistical significance, we use the Patell Z-test.

Table 3 reports the average cumulative abnormal return around the announcements of actual share repurchases. The windows (−20, −1) and (−10, −1) are used to examine whether firms tend to repurchase when the stock price underperforms the market. Repurchasing when the stock price follows a downward trend is consistent with both the market timing and the price support hypothesis. The window (0, +1) aims to capture the effect of the initial announcement. The windows (+2, +10) and (+2, +20) are used to examine the short-term market reaction immediately after the announcement and a month (approximately 20 trading days) after the announcement.

The results for the full sample (Panel A of Table 3) suggest that companies buy shares after intervals where the stock price shows a downward trend. The immediate response is not statistically significant. In the period immediately after the announcement, i.e., event window (+2, +10), investors show a slightly positive reaction that gradually disappears. Between (+2, +20), the reaction is not statistically different from zero. This is corroborated by Figure 1, which shows the cumulative average abnormal return for the 41-day period surrounding the announcement date (−20, +20). The results are consistent with the price support hypothesis (**H2)** rather than the market timing hypothesis (**H1**), and agree with Ginglinger and Hamon (2007).

The next section examines whether and how some company and repurchase characteristic affect the company repurchase decision and the market reaction.

(Insert **Table 3** here)

(Insert **Figure 1** here)

### *4.2. Share price performance related to company and repurchase characteristics*

Various studies suggest that company characteristics affect the company repurchase activity as well as the investors' reaction. Dittmar (2000) argues that different firms proceed to buybacks for different reasons. Ikenberry et al. (1995, 2000) find that companies with higher book-to-market ratio report higher long-term abnormal return after the announcement of SRP authorizations. Furthermore, the market reacts more favorably to buyback announcements of smaller companies. Cook et al. (2004) observe that larger firms repurchase after periods when the price of the stock underperforms the market.

We proceed with the examination of the company characteristics. In Panel B of Table 3 the announcements are grouped according to firm size and B/M ratio. The firm size is estimated as the market value of equity. Quartile rankings are computed using all listed firms on the day of the actual repurchases announcement.

Overall, the results suggest that smaller firms and firms with higher B/M ratio (whose shares are likely to be undervalued) repurchase shares even though the share price has not experienced any abnormal change in the period preceding the announcement. Investors short-term reaction is positive and statistically significant. Larger firms and firms with lower B/M ratio repurchase shares after intervals when the shock price follows a declining path. Following the share buyback, we observe a stabilization of prices. Thus, the results for smaller firms and firms with higher B/M ratio are in accordance with the signaling undervaluation hypothesis (**H3**). The results for the larger firms and firms with lower B/M ratio are consistent with the price support hypothesis (**H2**). The findings are similar to those of Zhang (2005).

In Panel C of Table 3 the data are grouped according to repurchase characteristics. Following the methodology of Zhang (2005) we used three variables: a) the number of days that elapse between the announcement under consideration and the immediately preceding announcement within a year period, b) the number of company announcements in the quarter preceding the current announcement, c) the percentage of shares acquired over the number of outstanding shares. The first two variables estimate the degree of "surprise" of the announcement, that is whether it was expected or unexpected by investors. The announcements are divided into two categories with cut-off point the median of each distribution. The third variable is an estimate of the signal's strength. In this case the announcements are divided into two equal subsets.

When the announcements are frequent (either the interval between the announcements is less than three days or the number of announcements is greater than the median in the preceding quarter) the initial reaction is not statistically significant, which is somehow expected. For the cases where the number of days since the previous announcement and the repurchase size are small, we observe negative and statistically significant abnormal reaction for the preceding period. The CAR(+2,+20) is not statistically significant. The results are in accordance the price support hypothesis. For the cases where the number of announcements is small in the quarter before the announcement the findings are consistent with the market timing hypothesis. For the cases where the repurchase size is high, the results support the signaling undervaluation hypothesis. Overall, we conclude that hypotheses **H4** and **H5** hold.

### *4.3. Share price performance related to the reason for program authorization*

In Greece companies are required to announce the reason for initiating a SRP at the date of the program authorization. The most common reason for authorization, as stated by the companies,

is stock undervaluation. For a large percentage of the programs, the reason is not explicitly stated (the company just states that the acquisitions will be conducted in accordance to the respective applicable laws). Few programs fall into a third category, with various causes of approval, for example, the cancellation of shares to reduce its share capital, sell-back to the market, distribution to employees or a combination of these reasons.

Using the categorization mentioned above, we examine the market reaction to announcements of actual share repurchases. The evidence in Table 4 indicates that the short-term market reaction is greater when the firm-stated reason for authorizing a SRP is to support the stock price in case of undervaluation. When the reason is not explicitly stated, the CAR for the preceding period is negative and statistically significant, while the short-term CAR(+2, +20) is not statistically significant. The results are consistent with the hypothesis that firms repurchase in a contrarian fashion to stem the decline in its stock price. When the reason is very specific but other than supporting the stock price, it appears that the information is already incorporated in the share price and there is no statistically significant reaction. Therefore, there is evidence that hypothesis **H6** holds.

(Insert **Table 4** here)

## *4.4. Factors affecting the market reaction*

Cross-sectional regression analysis is used, to examine whether and to what extent some characteristics of companies and announcements affect the market reaction to actual share repurchase announcements. Following Zhang (2005), we regress the initial market reaction, CAR(0, +1), the immediate short-term reaction, CAR(+2, +10), and a month after the announcement, CAR(+2, +20), on firm and repurchase characteristics.

Table 5 reports summary statistics for the variables we use in our regression analysis. "Firm size" is the natural logarithm of the market value of equity and "B/M" is the book-to-market ratio, both measured on the day of the announcement. "CAR(−20, −1)" denotes the abnormal return for the month before the announcement. "NDLR" is the number of days since last repurchase announcement and estimates the time between the announcement under consideration and the previous one, within a year. "NAP3M" is the number of announcements during preceding 3 months calculated by the announcements made within the last 90 days before the announcement under examination. The variables "NDLR" and "NAP3M" are determined based on Zhang's (2005) methodology. "NTDA" is the number of trading days included in the announcement and reports the trading days that the firms acquired shares and are disclosed on the same day. "Repurchase size" is the percentage of repurchased shares relative to shares outstanding. We also include dummy variables for the three different groups of stated reasons for SRP authorization: price support in case of undervaluation, not specific reason and stated reason other than price support. Since the coefficients of the dummy variables are not statistically significant in any case, they are not further reported. Also, to reduce the influence of extreme values, the variables are formed by winsorizing at the 1$^{st}$ and 99$^{th}$ percentiles.

(Insert **Table 5** here.)

Table 6 shows the results of three main regression models with the method of ordinary least squares (OLS). We observe that the coefficient of the B/M ratio is positive, a finding that supports the signaling undervaluation hypothesis. Also, the investors reaction is negatively related to the number of announcements in the previous quarter, a result that is different from Zhang (2005). Interestingly, the coefficient of the abnormal performance in the period before the announcement is positive and statistically significant only in the period (+2, +10).

(Insert **Table 6** here)

### *4.5. Long term price performance*

We examine long term returns to see if managers can actively take advantage of mispricing opportunities. We follow the methodology of Barber and Lyon (1997) and compare one-, two- and three-year buy-and-hold returns (BHRs) against a control sample, using monthly data.[2] The firms in the control sample are selected by first requiring the matching firm to have a market value between 70% and 130% of the repurchasing firm in the same calendar year, and then selecting the firm with the closest B/M to that of the repurchasing firm.

As shown in Panel A of Table 7, the repurchasing firms outperform the control firms for all periods. The negative return signs are a result of the falling equity market especially after 2007. The BHARs are 11.57%, 18.1% and 29.18% for the one-, two-, and three-year holding periods and significantly different from zero at the 1% level, thereby confirming hypothesis **H7**. This is consistent with the notion that managers have successfully used repurchases to support the stock price and add value for their shareholders. Note that the result is different from Akyol and Foo (2013) and Zhang (2005) who do not find significant long-term abnormal returns for repurchasing firms.

Further examination of the BHARs by size quantile in Panel B of Table 7, the repurchasing firms exhibit statistically significant abnormal returns, especially the smaller ones. Furthermore, considering the B/M characteristics of the firms, we observe that the BHARs for repurchasing firms are positive and most of them are significant at the 1% level. The firms with

[2] Thus, our total data coverage extends to 2013, three years beyond the announcements period.

the highest B/M ratios (quartile 1 and 2), seem to perform better than control firms, especially in three-year holding horizons, and this result agrees with Zhang (2015).

Regarding the relationship between announcement reasons and long-term returns, all the stated reasons for conducting a repurchase are positively related to BHARs, as shown in Table 8. However, when the company's reason for conducting a repurchase is specified in the announcement and it is different from stock undervaluation, the repurchasing firms seem to exhibit the strongest long-term abnormal performance.

The three-year BHAR is regressed against several variables, as shown in Table 9. We conclude that the B/M variable is negatively related to the return, as expected. Also, the number of repurchases made during the preceding three-month period is positive and statistically significant. In other words, frequent repurchasers seem to be characterized by high long-term price performance.

Insert **Table 7** here.

Insert **Table 8** here.

Insert **Table 9** here.

### *4.6. Robustness tests*

We also perform sensitivity tests: (1) using alternative estimation periods (−250, −31) and (−300, −41); (2) using alternative short-run announcement period return windows such as (−1, +1) and (−2, +2); (3) winsorizing the returns at the 1$^{st}$ and 99$^{th}$ or 5$^{th}$ and 95$^{th}$ percentiles to control for outliers; (4) using other parametric and non-parametric test methods such as the standardized cross-sectional test of Boehmer et al. (1991), which accounts for event-induced variance, and the rank test of Corrado (1989); and (5) using other benchmark models such as the market-adjusted

return model, the mean-adjusted return model, and the market model with the Scholes-Williams beta estimation method. None of these variations changes our results.

Akyol and Foo (2013) follow the methodology of Zhang (2005) with a slight variation: For the calculation of the variables that assess the degree of "surprise", they impose a further restriction that the announcements are made under the same program. We use the same modification to re-estimate the abnormal returns. The results are similar.

During the period under examination, some firms made only one share repurchase announcement. Other firms repurchased almost daily while their SRP was in effect. To examine if the Mean CAR has been affected by the companies with the largest number of announcements, we conduct the following test. We calculate the average cumulative abnormal return for each company separately and then carry out significance tests across firms. The results do not change.

To ensure that our results are robust to the clustering problem, we use alternative techniques for estimating standard errors and found similar results. We calculate standard errors adapted for heteroskedasticity and autocorrelation according to Newey and West (1987). Finally, we group the residuals in two dimensions, by company and by day, following the two-way technique proposed by Petersen (2009) and Thompson (2011). The coefficients of the variables about the stated reasons for SRP authorizations are not statistically significant in any model.[3]

## 5. Conclusions

The paper contributes further evidence to the literature on actual share repurchases in non-USA markets which are characterized by timely disclosure of buyback transactions. That literature is

[3] All robustness tests are available from the authors upon request.

loosely defined by articles such as: Brockman and Chung (2001); Zhang (2005); McNally et al. (2006); Ginglinger and Hamon (2007); and Akyol and Foo (2013).

Using data from the Greek stock market, we examine when companies choose to implement their approved SRPs, and how investors react when they are notified about company actions such as actual repurchases. In addition, we investigate how some company characteristics (firm size and book-to-market ratio) and some company choices (frequency and size of repurchases), as well as the preceding mandatory company announcement stating the reason for approving an SRP affect the behavior of companies and investors in the short- and the long-term.

Our results show that companies whose stock is more likely to be underpriced acquire their own shares without a preceding decline in stock prices, and the reaction of investors is positive. The results are consistent with the signaling undervaluation hypothesis. The rest of the companies acquire shares after periods in which the stock price exhibits a declining trend. After the acquisition of the shares, the stock price exhibits signs of stabilization in the short run, a fact that is in line with the hypothesis of stock price support. In addition, the company's earlier stated reason for approving SRPs seems to play some role in the market reaction to announcements of daily repurchases. Long-term abnormal returns are higher for repurchasing firms compared to non-repurchasing controls, and depend positively on the frequency of repurchases and the initial stated reason for program authorization.

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**Figure 1**

Mean CAR for the window (−20,+20). Day "0" on the horizontal axis is the date of the announcement of the actual share repurchases

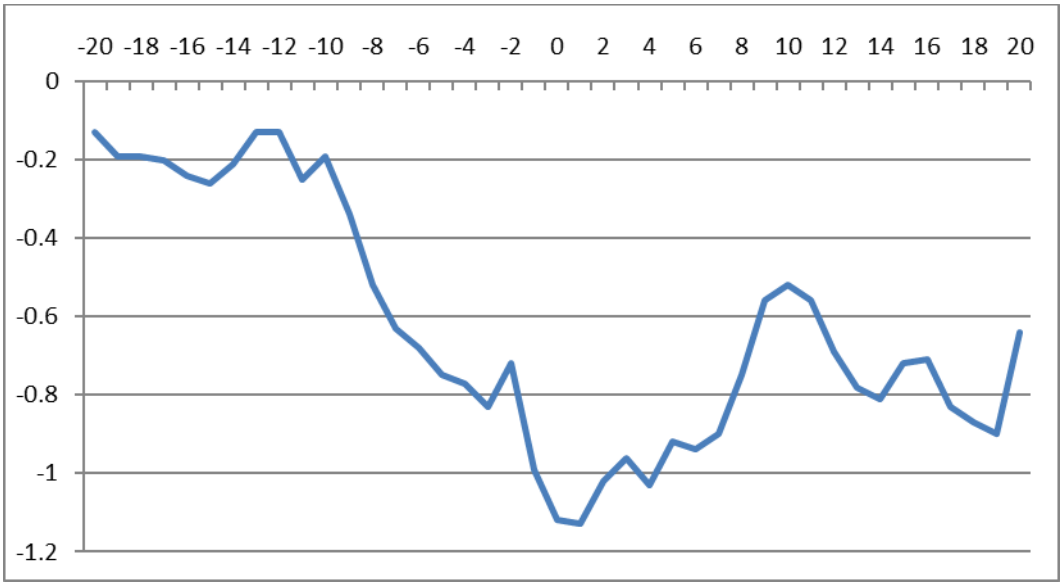

**Table 1**

Summary statistics of daily share repurchases in Greece from August 2005 to December 2010

| | |
|---|---|
| *Panel A: Full dataset* | |
| Number of firms | 74 |
| Number of program authorizations | 120 |
| Number of repurchase announcements | 7,619 |
| Number of repurchase days | 9,664 |
| Total number of shares repurchased | 276,627,699 |
| Value of repurchased shares (in euro) | 3,172,032,951 |
| Average repurchase days (per firm) | 131 |
| Average repurchase announcements (per firm) | 103 |
| *Panel B: Reason for excluding announcements* | |
| Preference shares | 87 |
| The number of shares or the average price is not known for every day separately | 42 |
| Late announcements | 1 |
| Repetition of repurchase date | 9 |
| Missing information | 2 |
| The announcement reported more than seven trading days | 10 |
| Reverse split | 5 |
| *Panel C: Dataset after excluding the announcements in Panel B* | |
| Number of firms | 69 |
| Number of program authorizations | 109 |
| Number of repurchase announcements | 7,463 |
| Number of repurchase days | 9,065 |
| Total number of shares repurchased | 269,574,548 |
| Value of repurchased shares (in euro) | 1,827,838,405 |
| Average repurchase days (per firm) | 131 |
| Average repurchase announcements (per firm) | 108 |
| *Panel D: Number of repurchase announcements per firm* | |
| Number of firms with less than 10 repurchase announcements | 11 (16%) |
| Number of firms with 11-20 repurchase announcements | 9 (13%) |
| Number of firms with 21-50 repurchase announcements | 12 (17%) |
| Number of firms with 51-100 repurchase announcements | 14 (20%) |
| Number of firms with more than 100 repurchase announcements | 23 (33%) |

**Table 2**

Descriptive statistics of open market share repurchases from August 2005 to December 2010

| *Panel A: Size and B/M quartiles* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Repurchase | Size quartile | | | | Book-to-market quartile | | | |
| | announcement | 1(small) | 2 | 3 | 4(large) | 1(high) | 2 | 3 | 4(low) |
| 2005 | 10 | 0 | 7 | 3 | 0 | 0 | 7 | 3 | 0 |
| 2006 | 49 | 0 | 21 | 14 | 14 | 5 | 22 | 13 | 9 |
| 2007 | 86 | 2 | 16 | 33 | 35 | 33 | 12 | 17 | 24 |
| 2008 | 240 | 19 | 70 | 35 | 116 | 50 | 43 | 77 | 70 |
| 2009 | 230 | 39 | 46 | 57 | 88 | 39 | 110 | 30 | 51 |
| 2010 | 211 | 16 | 48 | 61 | 86 | 32 | 63 | 65 | 51 |
| All | 826 | 76 | 208 | 203 | 339 | 159 | 257 | 205 | 205 |

| *Panel B: Distribution of trading days per announcement* | | | | | | | |
|---|---|---|---|---|---|---|---|
| Trading days per announcement | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Number of announcements | 631 | 59 | 37 | 26 | 49 | 21 | 3 |
| Percent | 76.5 | 7.1 | 4.5 | 3.1 | 5.9 | 2.5 | 0.4 |

**Table 3**

Abnormal share price performance surrounding announcements of actual share repurchases

| | | | Window | | | | |
|---|---|---|---|---|---|---|---|
| | | N | (−20,−1) | (−10,−1) | (0,+1) | (+2,+10) | (+2,+20) |
| Panel A: Full sample | | | | | | | |
| CAR | | 826 | −0.95%*** | −0.74%*** | −0.14% | 0.58%** | 0.46% |
| | | | (−2.88) | (−2.83) | (−0.98) | (2.05) | (0.84) |
| Panel B: Announcements grouped by firm characteristics | | | | | | | |
| *1. By size quartile* | | | | | | | |
| CAR | 1 (small) | 76 | 2.22% | 0.16% | −0.17% | 2.19%* | 3.67%** |
| | | | (1.21) | (0.12) | (0.06) | (1.77) | (2.50) |
| CAR | 2 | 208 | −0.62% | −0.22% | −0.47%* | −0.05% | 0.01% |
| | | | (−0.59) | (−0.12) | (−1.89) | (−0.15) | (0.15) |
| CAR | 3 | 203 | −0.98% | −0.45% | 0.08% | 0.77%* | 1.10% |
| | | | (−1.33) | (−0.71) | (0.29) | (1.67) | (1.17) |
| CAR | 4 (large) | 339 | −1.85%*** | −1.44%*** | −0.06% | 0.50% | −0.36% |
| | | | (−3.58) | (−3.83) | (−0.29) | (1.12) | (−0.90) |
| *2. By B/M quartile* | | | | | | | |
| CAR | 1 (high) | 159 | 1.53% | 0.70% | 0.56%* | 2.15%*** | 2.56%** |
| | | | (0.79) | (0.77) | (1.88) | (2.67) | (2.21) |
| CAR | 2 | 257 | −0.28% | −0.26% | −0.22% | 0.48%* | 0.95%* |
| | | | (0.04) | (−0.42) | (−0.64) | (1.70) | (1.75) |
| CAR | 3 | 205 | −2.82%*** | −1.44%*** | −0.22% | −0.39% | −1.18%* |
| | | | (−3.64) | (−2.66) | (−0.56) | (−0.87) | (−1.78) |
| CAR | 4 (low) | 205 | −1.84%*** | −1.77%*** | −0.50%** | 0.47% | −0.13% |
| | | | (−2.88) | (−3.24) | (−2.34) | (0.72) | (−0.45) |
| Panel C: announcements grouped by repurchase characteristics | | | | | | | |
| *1. By number of days since last repurchase announcement* | | | | | | | |
| CAR | ≤ 3 | 422 | −1.34%*** | −1.10%*** | −0.11% | 0.97%** | 0.70% |
| | | | (−2.97) | (−3.21) | (−0.46) | (2.00) | (0.52) |
| CAR | > 3 | 404 | −0.55% | −0.37% | −0.17% | 0.17% | 0.22% |
| | | | (−1.09) | (−0.77) | (−0.93) | (0.89) | (0.66) |
| *2. By number of announcements during the preceding 3 months* | | | | | | | |
| CAR | ≤ 13 | 416 | −1.79%*** | −1.08%*** | −0.15% | 1.31%*** | 1.38%** |
| | | | (−3.36) | (−2.60) | (−0.98) | (3.70) | (2.44) |
| CAR | > 13 | 410 | −0.10% | −0.40% | −0.13% | −0.16% | −0.47% |
| | | | (−0.71) | (−1.40) | (−0.40) | (−0.82) | (−1.27) |
| *3. By repurchase size (%)* | | | | | | | |
| CAR | low | 413 | −1.18%*** | −0.80%** | −0.24% | 0.26% | −0.03% |
| | | | (−2.69) | (−2.46) | (−1.18) | (0.60) | (−0.65) |
| CAR | high | 413 | −0.73% | −0.68% | −0.03% | 0.90%** | 0.95%* |

| | | | | | |
|---|---|---|---|---|---|
| | (−1.38) | (−1.54) | (−0.20) | (2.30) | (1.83) |

The CARs are measured against the market model with the estimation period from 200 to 21 days before the announcement. The Patell Z-test for the significance of means is shown in parentheses. The symbols *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

**Table 4**

Mean CAR grouped by the reason for initiating the SRP, as stated in the company announcement.

| | Window | | | | |
|---|---|---|---|---|---|
| | (−20,−1) | (−10,−1) | (0,+1) | (+2,+10) | (+2,+20) |
| *1. Stock considered undervalued* | | | | | |
| CAR | −0.68% | 0.27% | 0.08% | 1.11%* | 1.77%** |
| | (−0.02) | (1.17) | (0.29) | (1.76) | (2.10) |
| *2. Non-stated reason* | | | | | |
| CAR | −1.37%*** | −1.20%*** | −0.19% | 0.65%* | 0.52% |
| | (−3.52) | (−4.05) | (−0.98) | (1.71) | (0.63) |
| *3. Stated reason, other than stock undervaluation* | | | | | |
| CAR | 0.49% | 0.35% | −0.09% | −0.08% | −0.70% |
| | (0.15) | (0.34) | (−0.62) | (0.00) | (−1.04) |

The CARs are measured against the market model with the estimation period from 200 to 21 days before the announcement. The number of announcements is 104, 576 and 146 for the first, second and third category of stated reason, respectively. The Patell Z-test for the significance of means is shown in parentheses. The symbols *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

**Table 5**

Descriptive statistics

| | CAR (0,+ 1) | CAR (+2,+10) | CAR (+2,+20) | Firm Size | B/M | CAR (−20, −1) | NDLR | NAP3M | NTDA | Repurchase size (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| Mean | −0.001 | 0.006 | 0.005 | 11.667 | 1.591 | −0.01 | 11.838 | 21.505 | 1.642 | 0.038 |
| Median | −0.003 | 0.002 | 0.002 | 11.161 | 1.104 | −0.011 | 3 | 13 | 1 | 0.014 |
| Std. Dev. | 0.037 | 0.076 | 0.112 | 1.93 | 2.441 | 0.118 | 25.996 | 20.02 | 1.356 | 0.069 |
| Min | −0.15 | −0.474 | −0.652 | 8.53 | 0.112 | −0.69 | 0 | 0 | 1 | 0 |
| Max | 0.224 | 0.488 | 0.409 | 16.922 | 16.915 | 0.409 | 247 | 66 | 7 | 0.848 |
| Obs. | 826 | 826 | 826 | 826 | 826 | 826 | 826 | 826 | 826 | 826 |

The CARs are measured against the market model with the estimation period from 200 to 21 days before the announcement. “Firm size” is the natural logarithm of the market value of equity on the announcement date. “B/M” is the book-to-market ratio measured on the announcement date. “NDLR” is the number of days since last repurchase announcement. “NAP3M” is the number of announcements during preceding 3 months. “NTDA” is the number of trading days included in the announcement. “Repurchase size” is the percentage of repurchased shares relative to shares outstanding.

**Table 6**

Regression results

| | CAR (0,+1) | CAR (+2,+10) | CAR (+2,+20) |
|---|---|---|---|
| Intercept | −0.011 | 0.014 | 0.068** |
| | (−1.24) | (0.69) | (2.10) |
| CAR (−20,−1) | −0.022 | 0.052** | 0.048 |
| | (−1.27) | (2.03) | (1.15) |
| Firm size | 0.001 | 0.000 | −0.004 |
| | (0.99) | (−0.05) | (−1.85) |
| B/M | 0.001*** | 0.002** | 0.001 |
| | (4.35) | (2.10) | (0.77) |
| NDLR | 0.000 | 0.000 | 0.000 |
| | (−1.21) | (−0.23) | (−0.26) |
| NAP3M | 0.000 | −0.001** | −0.001** |
| | (−0.18) | (−2.50) | (−2.30) |
| NTDA | 0.001 | −0.002 | 0.000 |
| | (0.64) | (−0.91) | (−0.06) |
| Repurchase size | 0.004 | 0.056 | 0.038 |
| | (0.22) | (1.39) | (0.67) |
| Obs. | 826 | 826 | 826 |
| Number of firms | 69 | 69 | 69 |
| R-squared | 0.011 | 0.023 | 0.023 |

The CARs are measured against the market model with the estimation period from 200 to 21 days before the announcement. "Firm size" is measured by the natural logarithm of the market value of equity. "B/M" is the book-to-market ratio. "NDLR" is the number of days since last repurchase announcement. "NAP3M" is the number of announcements during preceding 3 months. "NTDA" is the number of trading days included in the announcement. *t*-tests are reported in parentheses. Standard errors are clustered at the firm level. "Repurchase size" is the percentage of repurchased shares relative to shares outstanding. The symbols ** and *** denote statistical significance at the 5% and 1% levels, respectively.

**Table 7**

Long-term buy-and-hold returns following actual share repurchases up to three years

| | | 1-Year | | 2-Year | | 3-Year | |
|---|---|---|---|---|---|---|---|
| | | N | Return | N | Return | N | Return |
| *Panel A: Full sample* | | | | | | | |
| Repurchase firms | | 701 | −9.58% | 612 | −27.82% | 519 | −22.81% |
| Control firms | | | −21.15% | | −45.92% | | −51.99% |
| Difference | | | 11.57%*** | | 18.10%*** | | 29.18%*** |
| *t*-test | | | (7.97) | | (9.14) | | (8.87) |
| *Panel B: Announcements grouped by firm characteristics* | | | | | | | |
| *1. By size quartile* | | | | | | | |
| Repurchase firms | 1 (small) | 54 | −12.83% | 36 | 11.73% | 10 | 49.01% |
| Control firms | | | −27.84% | | −37.88% | | −70.08% |
| Difference | | | 15.01%** | | 49.61%*** | | 119.09%** |
| *t*-test | | | (2.14) | | (3.41) | | (2.75) |
| Repurchase firms | 2 | 175 | −14.25% | 150 | −29.99% | 125 | −29.68% |
| Control firms | | | −17.41% | | −47.08% | | −43.88% |
| Difference | | | 3.16% | | 17.09%*** | | 14.20%** |
| *t*-test | | | (1.12) | | (4.60) | | (2.49) |
| Repurchase firms | 3 | 173 | −7.70% | 142 | −17.28% | 127 | 10.43% |
| Control firms | | | −28.18% | | −44.15% | | −55.31% |
| Difference | | | 20.48%*** | | 26.87%*** | | 65.74%*** |
| *t*-test | | | (7.61) | | (6.57) | | (7.17) |
| Repurchase firms | 4 (large) | 299 | −7.36% | 284 | −36.95% | 257 | −38.68% |
| Control firms | | | −18.08% | | −47.21% | | −53.58% |
| Difference | | | 10.72%*** | | 10.26%*** | | 14.90%*** |
| *t*-test | | | (4.99) | | (4.14) | | (5.10) |
| *2. By B/M quartile* | | | | | | | |
| Repurchase firms | 1 (high) | 147 | −17.58% | 128 | −30.73% | 95 | −28.42% |
| Control firms | | | −27.09% | | −44.83% | | −59.06% |
| Difference | | | 9.51%*** | | 14.10%*** | | 30.64%*** |
| *t*-test | | | (3.27) | | (3.71) | | (4.71) |
| Repurchase firms | 2 | 226 | −9.09% | 187 | −19.40% | 171 | 1.02% |
| Control firms | | | −25.26% | | −46.62% | | −50.72% |
| Difference | | | 16.17%*** | | 27.22%*** | | 51.74%*** |
| *t*-test | | | (5.99) | | (7.08) | | (6.67) |
| Repurchase firms | 3 | 151 | −11.82% | 132 | −28.66% | 101 | −33.06% |
| Control firms | | | −14.53% | | −46.88% | | −46.81% |
| Difference | | | 2.71% | | 18.22%*** | | 13.75%*** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *t*-test | | | (0.87) | | (4.07) | | (2.96) |
| Repurchase firms | 4 (low) | 177 | −1.67% | 165 | −34.42% | 152 | −39.29% |
| Control firms | | | −16.64% | | −45.20% | | −52.43% |
| Difference | | | 14.97%*** | | 10.78%*** | | 13.14%*** |
| *t*-test | | | (5.34) | | (3.02) | | (3.09) |

Long-term returns are measured using the Barber and Lyon (1997) control-firm methodology using monthly data. The symbols **, and *** denote statistical significance at the 5% and 1% levels, respectively.

**Table 8**

Long-term buy-and-hold returns grouped by the reason for initiating the SRP, as stated in the company announcement.

| | 1-Year | | 2-Year | | 3-Year | |
|---|---|---|---|---|---|---|
| | N | Return | N | Return | N | Return |
| *1. Stock considered undervalued* | | | | | | |
| Repurchase firms | 84 | −5.78% | 70 | −16.93% | 68 | −25.45% |
| Control firms | | −11.76% | | −39.14% | | −53.76% |
| Difference | | 5.98% | | 22.21%*** | | 28.31%*** |
| *t*-test | | (1.58) | | (3.36) | | (3.25) |
| *2. Non-stated reason* | | | | | | |
| Repurchase firms | 482 | −10.05% | 411 | −30.52% | 345 | −26.70% |
| Control firms | | −20.58% | | −44.71% | | −47.47% |
| Difference | | 10.53%*** | | 14.19%*** | | 20.77%*** |
| *t*-test | | (5.89) | | (6.15) | | (6.47) |
| *3. Stated reason, other than stock undervaluation* | | | | | | |
| Repurchase firms | 135 | −10.28% | 131 | −25.15% | 106 | −8.45% |
| Control firms | | −29.05% | | −53.33% | | −65.55% |
| Difference | | 18.77%*** | | 28.18%*** | | 57.10%*** |
| *t*-test | | (5.91) | | (6.33) | | (5.42) |

Long-term returns are measured using the Barber and Lyon (1997) control-firm methodology using monthly data. The symbol *** denotes statistical significance at the 1% level.

**Table 9**

Regression Results

| | 1-Year BHARs | | | 2-Year BHARs | | | 3-Year BHARs | | |
|---|---|---|---|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 | Model 8 | Model 9 |
| Intercept | 0.307 | 0.312 | 0.354 | 1.109*** | 1.143*** | 1.189*** | 1.716** | 1.752** | 1.955*** |
| | (1.33) | (1.35) | (1.59) | (2.71) | (2.89) | (2.97) | (2.52) | (2.54) | (2.85) |
| CAR (−20,−1) | 0.183 | 0.185 | 0.181 | 0.143 | 0.161 | 0.133 | 0.568** | 0.593** | 0.549* |
| | (1.31) | (1.31) | (1.28) | (0.78) | (0.89) | (0.72) | (2.06) | (2.12) | (1.93) |
| Firm size | −0.018 | −0.018 | −0.016 | −0.074** | −0.074** | −0.068** | −0.122** | −0.124** | −0.116** |
| | (−1.07) | (−1.08) | (−0.96) | (−2.46) | (−2.59) | (−2.37) | (−2.55) | (−2.56) | (−2.63) |
| B/M | −0.020 | −0.020 | −0.023 | −0.050** | −0.050*** | −0.057*** | −0.062* | −0.061* | −0.087** |
| | (−1.33) | (−1.33) | (−1.51) | (−2.49) | (−2.65) | (−2.69) | (−1.86) | (−1.87) | (−2.23) |
| NDLR | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 |
| | (0.41) | (0.41) | (0.46) | (0.61) | (0.46) | (0.65) | (0.06) | (−0.02) | (0.08) |
| NAP3M | 0.004** | 0.004** | 0.004** | 0.004** | 0.005** | 0.004** | 0.009** | 0.010** | 0.009** |
| | (1.99) | (2.01) | (2.03) | (2.07) | (2.29) | (2.11) | (2.13) | (2.28) | (2.26) |
| NTDA | −0.016 | −0.024 | −0.025 | −0.036 | −0.076** | −0.053* | 0.007 | −0.032 | −0.029 |
| | (−0.97) | (−1.22) | (−1.34) | (−1.52) | (−2.20) | (−1.91) | (0.25) | (−0.69) | (−0.74) |
| Repurchase size | −0.131 | −0.107 | −0.185 | −0.338 | −0.086 | −0.404 | −1.642 | −1.390 | −1.786 |
| | (−0.28) | (−0.22) | (−0.38) | (−0.39) | (−0.09) | (−0.44) | (−1.29) | (−0.99) | (−1.34) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Stated reason - undervaluation | | 0.056 | | | 0.290* | | | 0.282 | |
| | | (0.68) | | | (1.77) | | | (1.46) | |
| Stated reason - not available | | | −0.077 | | | −0.158* | | | −0.317* |
| | | | (−1.30) | | | (−1.77) | | | (−1.94) |
| Obs. | 701 | 701 | 701 | 612 | 612 | 612 | 519 | 519 | 519 |
| Number of firms | 65 | 65 | 65 | 60 | 60 | 60 | 53 | 53 | 53 |
| R-squared | 0.059 | 0.061 | 0.067 | 0.122 | 0.147 | 0.141 | 0.157 | 0.169 | 0.190 |

Long-term abnormal returns (BHARs) are measured using the Barber and Lyon (1997) control-firm methodology using monthly data. "Firm size" is measured by the natural logarithm of the market value of equity. "B/M" is the book-to-market ratio. "NDLR" is the number of days since last repurchase announcement. "NAP3M" is the number of announcements during preceding 3 months. "NTDA" is the number of trading days included in the announcement. "Repurchase size" is the percentage of repurchased shares relative to shares outstanding. *t*-tests are reported in parentheses. The symbols *, **, and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.