

The Flexibility of Share Repurchase and Managerial Timing in Japan^{*}

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Abstract

This paper assesses whether managers are able to time the market using share repurchase execution data. In Japan, managers decide when to start the share repurchase program and the length of the program. Using unique repurchase execution data, we find the following: (1) firms announce repurchase programs in response to their own stock price declines; (2) the market recognizes repurchase announcements as a signal of stock undervaluation; (3) firms that announce repurchase programs and that actually buy back shares experience stock price discounts, but the stock prices of firms that are not purchased are not discounted; and (4) the larger the magnitude of the discount, the more shares firms repurchase. These results show that managers in Japan have timing ability and use it to purchase undervalued shares.

I. Introduction

The most fundamental difference between cash dividends and share repurchases is that the latter have flexibility.⁽¹⁾ Stephens and Weisbach (1998) and Jagannathan, Stephens, and Weisbach (2000) argue that the reason firms use share repurchases frequently lies in the flexibility afforded. As suggested by

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(1) For a review of theoretical and empirical studies on payout policy, see Allen and Michaely (2003), and for a review of share repurchase, see Grullon and Ikenberry (2000).

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Lintner (1956), dividends are stickier than repurchases because dividends imply a commitment that the firm will continue to pay out at the level of the dividend.

As suggested by Ikenberry and Vermaelen (1996) and Stephens and Weisbach (1998), it is thought that repurchases have flexibility in terms of timing of execution. Dividends are paid regularly and managers have no choice as to when to pay out cash; by distributing cash through repurchases, managers are able to choose the timing of execution. This flexibility of execution timing leads researchers to the view that the reason managers repurchase shares is that firms use share repurchases to buy back shares at undervalued prices.⁽²⁾

There are two methods to determine whether managers possess timing ability. One is to test long-run stock price performance after the share repurchase announcement or after execution of stock purchases (Ikenberry, Lakonishok, and Vermaelen (1995), Stephens and Weisbach (1998), Ikenberry, Lakonishok, and Vermaelen (2000), Zhang (2005), and Akyol and Foo (2013)). The other is to compare the cost or stock price that the firm actually paid with the pseudo-cost or stock price that the firm would have had to pay if it had chosen another day to repurchase shares (Brockman and Chung (2001), Cook, Krigman, and Leach (2004), Ginglinger and Hamon (2007), and Dittmar and Field (2015)).

The purpose of this paper is to investigate whether managers are able to time the market and take advantage of flexible share repurchases. It is thought that such an analysis would shed light on why firms distribute cash through repurchases instead of dividends. Furthermore, unlike previous studies, we use execution data not only for program-announced-and-actually-repurchased firms

(2) Stephens and Weisbach (1998) show that firms buyback shares in response to underpricing and conclude that firms use repurchase to exploit the flexibility inherent in repurchase programs.

but also for program-announced but not-repurchased firms, to test the managerial timing hypothesis. Whether managers succeed in repurchasing shares at lower prices depends on stock prices during the authorized period, that is, the period in which firms can freely buy back shares. If managers use their timing ability to purchase their undervalued shares, even if their stock price is undervalued at the time of program announcement, they would not buy their shares when the level of stock price during authorization periods is not undervalued. Using the execution data for program-announced but not-repurchased firms and showing results consistent with the managerial timing hypothesis, this paper contributes to the vast literature on share repurchase and managerial timing.

In Japan, firms can repurchase share in one of two ways. One method enables firms to set the timing and length of the authorized period.⁽³⁾ It seems that firms like flexibility. From 26 March 2004 to 15 November 2013, of the 3,897 share repurchase announcements that Tokyo Stock Exchange (TSE) first-section listed firms made, the number in which managers could not decide the authorized period is only 90.⁽⁴⁾

In addition, if managers are able to time the market, they purchase the permissible amount of shares if the stock price remains undervalued after program announcement. Therefore, by using a sample consisting of firms that announce repurchase programs that have flexibility with respect to the authorized period, we are able to investigate managerial timing ability in settings different from prior research.

(3) As noted in the next section, when firms adopt the other way to repurchase shares, the authorized period is set to one year.

(4) This is different from the number of our samples, because we impose restrictions for observations to be included our analysis, as explained in Section 3.

Using our unique data, we first examine whether actually repurchased firms tend to be undervalued and whether not repurchased firms do not tend to be seriously undervalued. To this end, we estimate a logit model and perform an event study. The results of the logit regression show that the probability of firms actually repurchasing shares is significantly higher when they experience serious stock price drops. This finding is consistent with the managerial timing hypothesis.

We then perform an event study to analyze stock price behavior around the event day. If managers have timing ability and the market recognizes this, then announcement of the share repurchase program should serve as a signal of stock price undervaluation. We find that abnormal returns around the event day are negatively correlated with prior abnormal return, and positively correlated with the target amount of shares intended to be repurchased. As suggested by Vermaelen (1981) and Comment and Jarrell (1991), such results support the signaling hypothesis. It seems that the market understands program announcement as a signal of undervaluation.

Finally, we compare average stock price during the authorized period with average stock price before and after that period to test manager timing ability, because it is well known that the methodology using long-run stock-price performance after repurchase program announcement suffers from a misspecification problem of test statistics.⁽⁵⁾

The average stock prices we adopt as a benchmark are calculated by averaging 180 daily closing prices before the first day of and after the last day of the authorization period and 360 daily closing prices consisting of these two

(5) See Kothari and Warner (1997), Berber and Lyon (1997), and Lyon, Barber, and Tsai (1999).

(6) periods. As a result of these tests, we find that in the group of program-announced and actually repurchased firms, the average stock price during the authorized period is significantly discounted relative to the average stock price before the authorized period; otherwise, in the group of not-repurchased firms, average stock price is not significantly discounted.

Furthermore, by using these average prices as a measure of undervaluation, we find that the number of shares actually repurchased is significantly negatively correlated with this measure. These results imply that firms purchase a lot of shares when their shares are undervalued. Our results indicate that in Japan, managers are able to time the market like managers in other countries.

II. Prior Research

There are two methods to determine whether managers possess timing ability. One is to test long-run stock price performance after the share repurchase announcement or after execution of stock purchases. The other is to compare the cost or stock price that the firm actually paid with the pseudo-cost or stock price that the firm would have had to pay if it had chosen another day to repurchase shares.

Ikenberry, Lakonishok, and Vermaelen (1995) show results that support the managerial timing hypothesis, that is, that managers take advantage of their timing ability. These authors generate evidence that program-announcing firms experience significant stock price decreases before announcements, and their

(6) Peyer and Vermaelen (2009) use six-month prior return to classify whether firms are undervalued. Also, the results of Dittmar and Field (2015) show that firms purchase shares with the most undervalued price relative to averaging stock price six months before and after announcement. Therefore, we use 180 days before and after average daily closing price during the authorization period to evaluate manager timing ability.

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long-run stock price performance post-announcement is significantly positive.⁽⁷⁾

As reported in Stephens and Weisbach (1998), in the U.S., program-announcing firms often do not purchase shares at all or there is the possibility that program length is more than three years; therefore, it is not clear whether these firms successfully buy back shares using their timing ability. Using executed data from Canadian, Hong Kong, and Australian stock markets, respectively, Ikenberry, Lakonishok, and Vermaelen (2000), Zhang (2005), and Akyol and Foo (2013) show that long-run stock price performance after repurchase execution is significantly higher than benchmark. These findings are consistent with the managerial timing hypothesis, because managers execute repurchases when their firms' stock prices are relatively low.

To our knowledge, Brockman and Chung (2001) is the first paper to compare the cost of actual repurchases with the pseudo-cost that managers would have to pay if they executed a buyback in a different period, selected by the managers. Using data from the Hong Kong Stock Exchange, where detailed data are published on a daily basis, these authors find that firms spend less money compared with the amount spent when they do not engage in buyback timing, but randomly repurchase shares.

To test managers' timing ability, Cook, Krigman, and Leach (2004) use U.S. market survey data. Comparing the actual cost to firms of repurchases with what the cost would have been from various accumulation strategies, these authors report that NYSE listed firms repurchase shares with undervalued prices, but

(7) These authors conclude that these stock price movements are explained by the market underreaction hypothesis, that is, the market initially underreacts to the signal of undervaluation, and stock price gradually rises to reflect this information. The reason that announcement of a share repurchase program serves as a signal is that the market believes that managers are able to recognize their own stock price undervaluation.

NASDAQ firms pay relatively high prices. Ginglinger and Hamon (2007) compute, for each trading day, the ratios of Vwap (value-weighted average price) relative to average Vwap over several months before and after each trading day and find that this ratio is significantly lower for repurchase days than for non-repurchase days. Although their results imply that managers are able to time the market, they conclude that share repurchases for Paris Exchange listed firms are motivated by price support.

Using U.S. repurchase execution data, Dittmar and Field (2015) employ two methods to evaluate manager timing ability in repurchasing shares when firm stock price is relatively low. These authors compare the price the firm actually paid with the average closing price during the repurchase month, and in one-, three-, and six-month windows before and after the repurchase. They show that relative repurchase price, defined as actually repurchased stock price divided by average closing price, is significantly negative. These authors also examine long-run stock price performance after execution of stock purchases. They find that long-run stock price performance is significantly positive and that it is significantly higher for the infrequent repurchase group, which succeeds in buying back shares at a discount price compared to the frequent repurchase group. Based on these results, they argue that managers are able to time the market.

III. Stock Repurchase in Japan

In Japan, when firms intend to repurchase shares, they must obey corporation law. Corporation law permits firms to repurchase shares in one of two ways. One way is to obtain shareholder approval for the share repurchase program at the annual shareholder meeting. Another way is to approve the program at a board meeting. To use the latter method, firms need to change their articles of

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incorporation to be able to authorize a share repurchase program with board approval.

Firms that elect to repurchase shares based on a program authorized via shareholder meeting determine an upper limit for the amount of money and an upper limit for the number of shares sought. In this method, firms set their authorization period to one year beginning from the day after the shareholder meeting to the day of the shareholder meeting the following year. Firms that decide to repurchase shares authorized by the board determine not only the maximum monetary amount and number of shares sought, but also the timing and length of the authorized period.⁽⁸⁾ Therefore, managers deciding to repurchase in this way can announce the share repurchase program as soon as they recognize that their stock price is undervalued.

After a program is authorized, firms begin repurchasing. Japanese firms buy back shares using two methods, open market purchases and out-of-market transactions. Repurchases executed through the auction market and the after-hours market are categorized as open market transactions. Firms that intend to buy back shares in the open market purchase shares from their shareholders via open market transactions as in other countries.⁽⁹⁾ Firms can select after-hours transactions as well. By using this method, firms not only benefit from purchasing shares without affecting share price and at a set price, they also fix the purchase price to the closing price one day prior to the repurchase execution day.

Tender offers and negotiated transactions are categorized as out-of-market transactions. The way firms buy back shares through tender offers is as in other

(8) The upper limit of the authorization period is set to one year.

(9) Some firms announce details of purchase before they actually purchase, but they are not required to make such an announcement.

countries. Firms using tender offers announce a single purchase price, number of shares sought, and an expiration date in advance. Unlike in the U.S. market, in some transactions, the purchase price is set at a discount level to the current stock price. In Japan, firms often use tender offers and negotiated transactions upon request by the seller. Also, in such transactions, firms buy back shares at a lower price than the current stock price. Therefore, we exclude from our sample observations in which, after the announcement, firms purchase shares through out-of-market transactions.

IV. Data

As mentioned above, we use a sample consisting of firms announcing share repurchase programs authorized by articles of incorporation. In addition, if firms use share repurchase as a signal of their stock price undervaluation, they would choose this method, because it enables them to make the announcement as soon as they recognize their stock price undervaluation. To construct our sample, we begin by obtaining records of common stock repurchase programs announced by TSE first-section listed firms between 26 March 2004 and 15 November 2013. We extract these announcement data from a database provided by Financial Data Solutions, Inc.⁽¹⁰⁾

The start day of our sample period is the first share repurchase program announcement made by TSE first-section listed firms obtained from the database. We also use stock return data to examine stock price reaction to the

(10) We can extract information about programs, such as announcement day, maximum amount of money spent, and maximum number of shares purchased. These elements also provide us information about execution, such as actual amount of money spent, actual numbers of shares bought back, period of purchase, and method used.

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program announcement. The latest stock return data we have are from 31 December 2013. The end-day of our sample period is set to allow us to analyze post-announcement price movement up to 30 days after the announcement. We exclude financial and utility firms from our sample. As a result, our sample consists of 3,493 announcements made by 970 firms.

Panel A of Table 1 shows number of announcements, target amounts, and target shares.⁽¹¹⁾ Firms planned to buy back shares most frequently in 2008. In that year, firms intended to buy back 2.7% of outstanding shares, spending about 2.9% of their equity market value. This finding is similar to the findings of Dittmar and Field (2015). These authors report that in the U.S., the largest number of firms repurchasing occurred in 2008. They also report that, in 2009, the number of repurchasing firms was lowest; in our sample, the second smallest number of firms announcing a share repurchase program also occurred in 2009.

In the right-hand column, we present information on programs announced by actually repurchased and not-repurchased firms. Out of 3,493 program announcements, share repurchases were not executed at all in 143 programs. After 2009, although the number of programs in which firms did not purchase tended to decrease, their target share and amount did not differ substantially from those of actual buyback firms.

The upper-half of Panel B shows the number of trading days from the announcement day to the first day of the authorized periods. This part of Panel B shows that, on average, authorized periods begin from three days after the

(11) Target amount is the upper bound of amounts sought divided by market value of equity at the time of announcement, calculated as stock price multiplied by number of shares outstanding, and target shares is the upper bound of shares sought divided by the number of shares outstanding at the time of announcement.

Table 1. Summary Statistics of the Share Repurchase Program

Panel A shows the number of programs announced each year and the total number of program announcements for the total sample and for the not-purchased group. *Target Share* (*Target Amount*) is the upper bound of shares (amount) sought divided by the number of shares outstanding (market value of equity, calculated as stock price multiplied by number of shares outstanding) at the announcement date.

Panel B shows the period from program announcement day to first day of the authorized period and the length of the authorized period.

Panel A				Repurchased Sample (Not Repurchased Sample)		
	Total Sample					
	Announcement	Target Share	Target Amount	Announcement	Target Share	Target Amount
2004	185	0.0182	0.0195	168 (17)	0.0178 (0.0212)	0.0193 (0.0221)
2005	403	0.0178	0.0186	351 (52)	0.0179 (0.0166)	0.0190 (0.0163)
2006	420	0.0193	0.0205	400 (20)	0.0193 (0.0192)	0.0206 (0.0192)
2007	479	0.0199	0.0220	470 (9)	0.0195 (0.0419)	0.0217 (0.0392)
2008	734	0.0266	0.0293	711 (23)	0.0267 (0.0247)	0.0294 (0.0269)
2009	213	0.0231	0.0250	206 (7)	0.0226 (0.0375)	0.0245 (0.0409)
2010	281	0.0208	0.0226	278 (3)	0.0208 (0.0138)	0.0227 (0.0136)
2011	290	0.0220	0.0229	285 (5)	0.0213 (0.0615)	0.0229 (0.0192)
2012	279	0.0228	0.0231	275 (4)	0.0223 (0.0591)	0.0232 (0.0100)
2013	209	0.0242	0.0245	206 (3)	0.0244 (0.0101)	0.0247 (0.0108)
Total / Avg	3,493	0.0218	0.0234	3,350 (143)	0.0217 (0.0240)	0.0235 (0.0215)

Panel B				
	Min	Mean	Median	Max
Period From Announcement Day to First Day of Authorized Period				
Total Sample	1	2.7130	2	36
Repurchased Sample	1	2.6971	2	36
Not Repurchased Sample	1	3.1061	2	19
Authorized Period				
Total Sample	1	56.0826	38	247
Repurchased Sample	1	54.8625	37	247
Not Repurchased Sample	1	82.8605	61	248

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program announcement day, and the maximum value implies that it takes 36 days for the firm to be able to purchase shares. The lower row shows that this period does not differ much from the purchased sample, except that the maximum value is smaller.

The lower half of Panel B shows the length of the authorized period, which is counted as the number of trading days. The upper row shows that the average (median) firm set its authorized period to 56 (38) days. Firms with the shortest authorized period (one day) plan to completely execute the repurchase one day after the announcement day. We find that program-announced but not-repurchased firms tend to set authorized periods a bit longer relative to the total sample. This result might imply that not-repurchased firms did not have confidence about their stock price undervaluation.

V. Timing of Share Repurchase Program Announcement

To test whether managers have timing ability, we begin by analyzing whether firms tend to announce their repurchase programs after experiencing a stock price decline.

Table 2 describe firm characteristics of the actually repurchased group and the not-purchased group, respectively. These variables, except for *PBHR*, are measured at the end of fiscal year $t-1$ (beginning of fiscal year t), where t is the fiscal year in which firms announce share repurchase programs. *Size* is calculated as daily closing price multiplied by number of shares outstanding. *B/M* is book value of equity divided by market value of equity, which is equal to *Size*. *PBHR* is six-month buy-and-hold return, which is calculated as compounding monthly return from seven months to one month before the program announcement month. *Debt* and *ROA* are total book value of debt and operating income divided

Table 2. Summary Statistics of Firm Characteristics

This table shows summary statistics of firm characteristics for actually repurchased and not-purchased firms. *Size* is market value of equity, calculated as stock price multiplied by number of shares outstanding. *B/M* is book value of equity divided by market value of equity. *Debt* is book value of debt divided by book value of assets. *ROA* is operating profit divided by book value of assets. These variables are measured at the end of fiscal year $t-1$ (beginning of fiscal year t), where t is the fiscal year in which firms announce the share repurchase program. *PBHR* is six-month buy-and-hold return, calculated as compounding monthly return from seven months to one month before the program announcement month. We delete all independent variables at the 1st and 99th percentiles. We perform the t test (rank sum test) for the difference in the means (medians) between actually repurchased group and not-purchased group.

	Repurchased Sample		Not Repurchased Sample		Repurchased-Not Repurchased	
	Mean	Median	Mean	Median	Mean	Median
<i>Size</i>	219,234	53,376	239,000	52,595	-19,766	781
<i>B/M</i>	0.9402	0.8623	0.8902	0.7881	0.0500	0.0742
<i>PBHR</i>	-0.0329	-0.0418	0.0181	0.0394	-0.0510***	-0.0812***
<i>Debt</i>	0.4241	0.4135	0.4722	0.4848	-0.0481***	-0.0713***
<i>ROA</i>	0.0700	0.0365	0.0638	0.0579	0.0062*	-0.0215
Observations	3,096		137		3,233	

*** Significant at the 0.01 level.

** Significant at the 0.05 level.

* Significant at the 0.10 level.

by book value of total assets, respectively.

Comparing these two groups, we find that actually repurchased firms have significantly lower *PHHR*. Also, they have significantly lower levels of debt and higher profitability. It does not appear that actually not-repurchased firms face serious underpricing. These results imply that it is likely that stock price movement affects the repurchase decision.

We next estimate a logit model to clarify how repurchase decisions relate to these firm characteristics, holding other factors constant. Table 3 shows the results estimated from a logit regression, where the dependent variable is a dummy variable that takes the value 1 if the firm does not repurchase share and 0 if the firm actually repurchase share during fiscal year t . We use standard error adjusted for heteroskedasticity and correlation across observations for a given

Table 3. Results of Logit Regression

This table shows the results of the logit regression. The dependent variable is a dummy variable that takes the value 1 if firms does not repurchase share and 0 if firms actually repurchase share during fiscal year t . $LnSize$ is the log of $Size$, which is the market value of equity, calculated as stock price multiplied by number of shares outstanding. B/M is book value of equity divided by market value of equity. $Debt$ is book value of debt divided by book value of assets. ROA is operating profit divided by book value of assets. These variables are measured at $t-1$ (beginning of fiscal year t), where t is the fiscal year in which firms announce the share repurchase program. $PBHR$ is six-month buy-and-hold return, calculated as compounding monthly return from seven months to one month before the program announcement month.

Standard error is adjusted for heteroskedasticity and correlation across observations of a given firm, but due to multicollinearity, we do not include time and industry dummy variables. We delete all independent variables at the 1st and 99th percentiles.

	<i>LnSize</i>	<i>B/M</i>	<i>PBHR</i>	<i>Debt</i>	<i>ROA</i>	Const	Pseudo R^2	Observations
Coefficient	-0.0157	-0.4596	1.0627***	1.0816	-4.0785	-3.7875**	0.0179	3,233
z-statistics	(-0.14)	(-1.06)	(2.63)	(1.49)	(-1.31)	(-2.26)		

*** Significant at the 0.01 level.

** Significant at the 0.05 level.

* Significant at the 0.10 level.

firm, but due to multicollinearity, we do not include time and industry dummy variables. We delete all independent variables at the 1st and 99th percentiles.

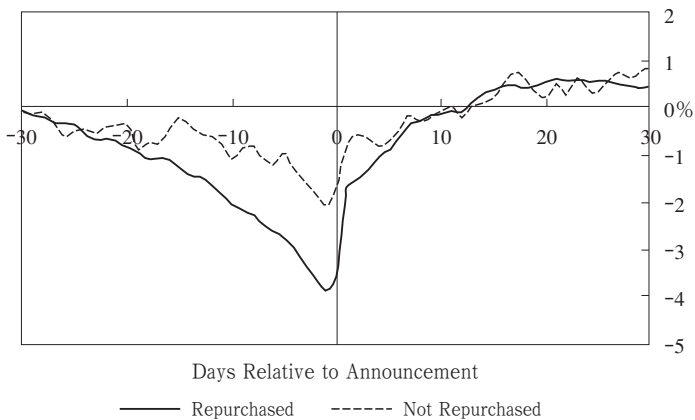
In Table 3, the only variable that significantly affects the purchase decision is $PBHR$. Table 3 shows that the probability of firms not buying back shares becomes higher when $PBHR$ is high.

The analysis above does not make clear whether the level of stock price for not-purchased firm is undervalued when they announce the program. Also, empirical evidence from previous research shows that announcing firms experience stock price increases in response to share repurchase program announcements. If stock price rises to a fair price or a price that managers recognize as the fair price, they cannot buy their shares at a discount price. Therefore, we examine whether stock price behavior of the actually repurchased group differs from that of the not-purchased group. To analyze this issue, we perform a standard event study.⁽¹²⁾

First, we exclude observations for which at least 100 daily returns are not available during the estimation period. In addition, to avoid confounding effects, if firms release timely disclosure information at the program announcement day, we exclude these observation from our analysis. As a result, 1,130 announcements remain, consisting of 1,051 actually executed and 79 not-executed repurchases.^(13, 14)

Figure 1. Mean Cumulative Abnormal Return

This figure depicts mean abnormal return from 30 days before to 30 days after announcement day. Solid and dotted lines indicate cumulative abnormal return (CAR) for actually repurchased group and not-repurchased group, respectively.



(12) The estimation window to estimate coefficient of market model is 150 days from $t-180$ to $t-31$, where t is the announcement day. We use daily return of TOPIX as the benchmark return.

(13) To do this, we checked timely disclosure information submitted to TSE by firms, which we obtain from eol which is the comprehensive corporate information database provided by Pronexus, Inc. When we do not exclude samples disclosed other than repurchase programs, we find similar stock price movements, though the level of prior underpricing is not as large as those of excluded samples.

(14) Japanese firms must timely disclose information that has any possibility of affecting the stock price.

Table 4. Abnormal Return around Announcement Day

This table shows average abnormal return at the announcement day (*AAR*), average cumulative abnormal returns summing the average abnormal returns from *s* to *e* day relative to announcement day, which is day 0 (*CAR(s,e)*), and the results of the mean comparison test between the actually purchased group and the not-purchased group. *t*-statistics are given in parentheses.

	<i>AAR</i>	<i>CAR</i> (-30,-2)	<i>CAR</i> (-30,-15)	<i>CAR</i> (-15,-2)	<i>CAR</i> (-1,0)	<i>CAR</i> (1,1)	<i>CAR</i> (0,1)	<i>CAR</i> (2,15)	<i>CAR</i> (15,30)	<i>CAR</i> (2,30)
Total Sample										
Mean	0.2643***	-3.4080***	-1.0865***	-2.3942***	0.0474	1.7926***	2.0417***	3.6655***	0.1047	3.7150***
<i>t</i> -statistics	(3.95)	(-10.64)	(-5.01)	(-10.43)	(0.51)	(13.66)	(17.63)	(15.00)	(0.48)	(11.71)
Observations	1106	1106	1106	1106	1106	1106	1106	1106	1106	1106
Repurchased Sample										
Mean	0.2622***	-3.4902***	-1.1051***	-2.4973***	0.0442	1.8403***	2.0871***	3.8497***	0.0335	3.8447***
<i>t</i> -statistics	(3.75)	(-10.32)	(-4.89)	(-10.37)	(0.45)	(13.30)	(17.22)	(15.07)	(0.15)	(11.57)
Observations	1029	1028	1028	1027	1029	1028	1028	1029	1028	1029
Not Repurchased Sample										
Mean	0.2919	-2.3253***	-0.8416	-1.0540	0.0896	1.1635***	1.4435***	1.2036	1.0427	1.9823**
<i>t</i> -statistics	(1.27)	(-2.71)	(-1.13)	(-1.47)	(0.33)	(3.16)	(3.83)	(1.58)	(1.35)	(1.95)
Observations	77	78	78	79	77	78	78	77	78	77
Difference (Repurchased-Not Repurchased)										
Mean	-0.0297	-1.1649	-0.2635	-1.4433**	-0.0454	0.6769*	0.6436	2.6461***	-1.0092	1.8624*
<i>t</i> -statistics	(-0.12)	(-1.26)	(-0.34)	(-1.91)	(-0.16)	(1.72)	(1.63)	(3.30)	(-1.25)	(1.74)

*** Significant at the 0.01 level.

** Significant at the 0.05 level.

* Significant at the 0.10 level.

Figure 1 depicts mean cumulative abnormal return (CAR), calculated by summing the sample average abnormal return from 30 days prior to 30 days after the announcement day. Solid (dotted) lines in this figure represent CAR for the actually executed group (not-executed group)⁽¹⁵⁾. Consistent with previous research, this figure shows that firms decide to repurchase shares after they experience stock price decline.

Table 4 shows the average abnormal return (AAR) at the announcement day and average CAR. $CAR(s,e)$ indicates the summed average abnormal return from s day to e day relative to the announcement day, which is set to 0. Therefore, a negative (positive) value of s or e indicates s or e day(s) before (after) the announcement day. All variables are deleted at the 1st and 99th percentiles. Examining CAR before the announcement day of purchased samples, we find significant stock price decreases. In response to the announcement, announcing-firm stock prices significantly increase and their run-up persists to 15 days after announcement.

Market reaction to program announcement is significantly positive. Mean CAR ⁽¹⁶⁾ $(-1,1)$ is 1.79%, comparable to prior research. For the purchased group, mean abnormal returns are all significant at the 1% significance level, except for $CAR(-1,0)$ and $CAR(15,30)$.

For the not-purchased group, $CAR(-30,-2)$ is significantly negative. This result shows that this group also confronts a stock price decline. However, $CAR(-30,-15)$ and $CAR(-15,-2)$ are not significant and the difference in $CAR(-15,$

(15) As is obvious from the sample size, CAR of total samples is almost the same as that of the actually executed sample, thus we do not show this.

(16) Vermaelen (1984), Comment and Jarrell (1991), Ikenberry, Lakonishok, and Vermaelen (1995), and Grullon and Michaely (2002) all report the same magnitude of announcement effect of the open market share repurchase program announcement.

-2) between the purchased and not-purchased groups is significant, so it does not appear that the magnitude of underpricing is serious in not-purchased firms. In addition, relative to purchased firms, the announcement effect of not-purchased firms is weak. Examining announcement-period abnormal return, we find that *AAR* for the not-purchased group is not significant, though the mean is higher than that of the purchased group. Although *CAR* (0,1) and *CAR* (-1,1) are significant, the difference in *CAR* (-1,1) between these two groups is also significant. These results show that stock price of actually repurchased (not-repurchased) firms drops 3.4% (2.3%) before the announcement and recovers to the level before the price drop in response to the repurchase program announcement.

Next, we examine whether these results are explained by signaling hypotheses, that is, whether the market recognizes the announcement as a signal of undervaluation. If the market realizes that managers are timing the market, then share repurchase program announcement should serve as a signal of stock undervaluation. To clarify this, we regress abnormal returns around the event days on target share, firm characteristics, and industry and year dummy variables. We delete all variables at the 1st and 99th percentiles. In this regression, we use standard error adjusted for heteroskedasticity and correlation across observations of a given firm.

The results are shown in Table 5, where *TARGET* is the same as Target Share in Panel A of Table 1, that is, the upper bound of the number of shares sought divided by outstanding shares at the time of announcement. We find that, in all specifications, abnormal returns are significantly positively correlated with *TARGET* and that, except for the model in which the dependent variable is *AAR* and *CAR* (-1,0), there is significant negative correlation between prior return

Table 5. Results of Abnormal Return Regression

This table shows the results of regressing abnormal returns around the event days on target share, firm characteristics, and industry and year dummy variables. *LnSize* is the log of *Size*, which is the market value of equity, calculated as stock price multiplied by number of shares outstanding. *B/M* is book value of equity divided by market value of equity. *Debt* is book value of debt divided by book value of assets. *ROA* is operating profit divided by book value of assets. These variables are measured at *t*-1 (beginning of fiscal year *t*), where *t* is the fiscal year in which firms announce the share repurchase program. *TARGET* is the same as *Target Share* in Panel A of Table 1, which is an upper bound of shares sought divided by number of shares outstanding at the announcement date. *CAR* (-15, -2) is cumulative abnormal return calculated by summing average abnormal return from 15 to 2 days prior to announcement day. We delete all variables at the 1st and 99th percentiles. *t*-statistics are given in parentheses. Standard error is adjusted for heteroskedasticity and correlation across observations of a given firm.

	Abnormal Return			
	<i>AAR</i>	<i>CAR</i> (-1,0)	<i>CAR</i> (-1,1)	<i>CAR</i> (0,1)
<i>Target</i>	3.5257 (0.74)	8.0613 (1.44)	40.8680*** (3.93)	42.9363*** (4.33)
<i>LnSize</i>	-0.0319 (-0.50)	-0.1408 (-1.48)	-0.1497 (-1.15)	-0.1144 (-1.06)
<i>B/M</i>	-0.3246 (-1.01)	-0.2114 (-0.50)	0.2377 (0.45)	-0.0754 (-0.15)
<i>CAR</i> (-15,-2)	-0.0213** (-2.01)	-0.0250* (-1.90)	-0.0311* (-1.80)	-0.0451*** (-2.79)
<i>ROA</i>	-3.7255* (-1.81)	-6.2126** (-2.34)	1.7959 (0.49)	-0.2742 (-0.08)
<i>Debt</i>	0.3548 (0.60)	0.3421 (0.47)	0.9062 (0.99)	0.4873 (0.56)
Const	1.1267 (0.66)	2.7871 (1.03)	-0.3525 (-0.13)	-0.6734 (-0.36)
Adjusted <i>R</i> ²	0.021	0.026	0.173	0.219
Observations	1,014	1,014	1,012	1,011

*** Significant at the 0.01 level.

** Significant at the 0.05 level.

* Significant at the 0.10 level.

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and abnormal return. As indicated by Vermaelen (1981) and Comment and Jarrell (1991), these results are consistent with signaling hypotheses, indicating that the market recognizes share repurchase program announcement as a signal of undervaluation.

As described above, program-announced firms experience significant price drop, though the magnitude of underpricing is smaller in the not-repurchased group. Moreover, their stock prices recover to the level before the stock price began to decline. Hence, with these results, we cannot conclude that managers are able to time the market. It is thought that if managers have timing ability, they would purchase share with the undervalued price and try to purchase as many shares as possible at that price. On the other hand, they would not buy back shares when they assess their stock price as not undervalued. Therefore, we next examine not only whether purchased firms are able to buy back shares with undervalued price and whether the stock prices of not-repurchased firms are not undervalued, but also whether the number of shares purchased is significantly negatively related to the magnitude of undervaluation.

VI. Timing of Actual Share Repurchase

Discount Test

To test management timing ability, we compare average daily closing price during authorized periods with average daily closing price during periods in which firms decide not to purchase. We compute the discount measures as follows.

$$Discount^{-(+)}$$

$$= \frac{\text{average daily closing price during authorization period}}{\text{average daily closing price from } t_f-180 \text{ to } t_f-1 (t_i+1 \text{ to } t_i+180)} - 1$$

(1)

where index $-(+)$ indicates that the denominator is average daily closing price computed by averaging 180 daily closing prices from $t_f-180(t_i+1)$ to $t_f-1(t_i-180)$, and

$$Discount^{\pm}$$

$$= \frac{\text{average daily closing price during authorization period}}{\text{average daily closing price from } t_f-180 \text{ to } t_f-1 \text{ and } t_i+1 \text{ to } t_i+180} - 1$$

(2)

where t_f and t_i represent the first and last days of the authorized period, respectively. As discussed in footnote 7, following Peyer and Vermaelen (2009) and Dittmar and Field (2015), we calculate $Discount^{-(+)}$ and $Discount^{\pm}$ divided by the average daily closing price using 180 daily closing prices and 360 daily closing prices, respectively. When firms repeat the program announcement and the period between the last (first) day of the authorized period of the program and the first (last) day of the authorized period of the next (prior) program is less than 180 days, we exclude the period that overlaps another program's authorized period from calculation of the denominator.

In this analysis, we exclude firm-years in which firms execute stock splits

(17) The discount measures calculated by using average daily closing price during the authorization period are not accurate, because firms do not always conduct daily repurchases and buy back shares at the closing price. However, by using these discount measures, we are able to test whether firms do not repurchase shares when the level of stock price is not discounted during the authorization period.

(18) We obtain similar results when we permit overlapping.

Table 6. Results of Test of Discount Measures

This table shows the results of the test of discount measures for the purchased and not-purchased groups. $Discount^-$ is calculated as average daily closing price during the authorized period divided by average daily closing price from t_f-180 to t_f-1 , minus 1, $Discount^+$ is calculated as average daily closing price during the authorized period divided by average daily closing price from t_i+1 to t_i+180 , minus 1, and $Discount^\pm$ is calculated as average daily closing price during the authorized period divided by average daily closing price from t_f-180 to t_f-1 and from t_i+1 to t_i+180 , minus 1, where t_f and t_i indicate the first day and last day of the authorized period, respectively.

	$Discount^-$		$Discount^+$		$Discount^\pm$	
	Repurchased	Not Repurchased	Repurchased	Not Repurchased	Repurchased	Not Repurchased
Mean	-0.0319***	0.0323*	0.0276***	-0.0257	-0.0202***	-0.0133
t -statistics	(-9.48)	(1.71)	(7.94)	(-1.39)	(-8.65)	(-0.92)
Median	-0.0295***	0.0313**	0.0306***	-0.0339**	-0.0204***	0.0000
z-statistics	(-9.69)	(2.05)	(4.18)	(-1.96)	(-8.58)	(-0.63)
Observations	2,970	106	2,957	104	3,011	122

*** Significant at the 0.01 level.

** Significant at the 0.05 level.

* Significant at the 0.10 level.

between t_f-180 and t_i+180 , including the authorized period. Table 6 shows the test results of these discount measures and provides results consistent with the market timing hypothesis. The results for the purchased group, reported on the left-hand side in each column, show that the mean and median of $Discount^-$ are significantly negative. The mean (median) purchased samples buy back shares at a 3.2% (3.0%) lower price relative to the period before the authorized period.

On the other hand, as indicated by the mean (median) $Discount^+$ for the purchased group, firms purchase at a significantly higher price than after the authorization period. These results show that the stock price of purchased firms continues to decline after the end of the authorized period. These results indicate that managers recognize that their stock price has declined, but they are not

aware that their stock price is to be further undervalued.

$Discount^+$ is significantly negative for the purchased group. It appears that, considering the fact that they are not able to buy back at the most undervalued price, firms nevertheless succeed in purchasing shares at a discount. The mean (median) value of $Discount^+$ is -2.02% (-2.03%) and significant. This magnitude of discount is comparable to the result in Dittmar and Field (2015). These authors report that, compared to the stock price six months before and after the buyback month, the average (median) U.S. firm purchases its shares at -2.37% (-1.77%), a significantly discounted price. These results are consistent with the managerial timing hypothesis.

Thus far, it is not obvious whether purchasing firms are able to actually repurchase at the discount price, because we use average daily closing price rather than actual price paid. In an untabulated test, we perform a difference test between average daily closing price during the authorized period and price actually paid, which is calculated as total amount paid divided by total number of shares purchased.⁽¹⁹⁾ The result shows that there is no significant difference, and this indicates that managers in Japan succeed in purchasing shares at an undervalued price.

For the not-purchased group, $Discount^-$ in Table 6 indicates that if firms execute repurchase, they would have paid a higher price relative to the price before the authorized period. The median $Discount^+$ is significantly negative at 5%, implying that the median firm would have been able to purchase at a 3.4% discount. Summing up the results, the result for $Discount^+$ does not show

(19) Also, we perform a difference test between total amount paid and pseudo-cost, which is calculated as total number of shares purchased times average daily closing price during the authorization period; we obtain a similar result.

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evidence that stock prices of not-purchased firms are underpriced during authorization periods. The results of these discount tests reveal that managers in Japan are able to time the market, and they use this ability when executing share repurchases.

Relationship between Completion Rate and Discount Measure

Here, we analyze how the amount of shares purchased relates to the discount measures. If managers have timing ability and use it to purchase shares at undervalued prices, it is thought that the larger the magnitude of undervaluation is, the greater the number of shares purchased. Stephens and Weisbach (1998), showing that previous-quarter return is negatively correlated with completion rate, conclude that firms use repurchase to buy back shares at discounted prices.

To test these notions, we regress completion rate on discount measures, target shares, firm characteristics and industry, and year dummy variables. We include target shares as an independent variable to reveal whether managers recognize the level of underpricing at the time of program announcement and to make constant the size of the program. Completion rate is number of shares actually repurchased divided by maximum number of shares sought. In our sample, this variable takes the value 1 for some and 0 for others. Therefore we use Tobit regression censored at 0 and 1 to account for the censoring problem. All variables except completion rate are deleted at the 1st and 99th percentiles. We use standard error adjusted for heteroskedasticity and correlation across observations of a given firm.

In Table 7, we report the results of a Tobit regression. The coefficient of *Discount*⁻ is significantly negative at the 1% significance level. This result indicates that managers buy back a lot of shares when their stock price is

Table 7. Results of Tobit Regression

This table shows the results of the Tobit regression. The dependent variable is completion rate, calculated as number of shares actually repurchased divided by the *Target Share* (upper bound of shares sought divided by number of shares outstanding), which is censored at 0 and 1. *TARGET* is an upper bound of shares sought divided by number of shares outstanding at the announcement date. *Discount*⁻, *Discount*⁺, and *Discount*[±] are calculated as shown in Table 6. *LnSize* is the log of *Size*, which is the market value of equity, calculated as stock price multiplied by number of shares outstanding. *B/M* is book value of equity divided by market value of equity. *CAR* (-15,-2) is cumulative abnormal return calculated by summing the average abnormal returns from 15 to 2 days prior to announcement day. *Debt* is book value of debt divided by book value of assets. *ROA* is operating profit divided by book value of assets. We delete all variables at the 1st and 99th percentiles. *t*-statistics are given in parentheses. Standard error is adjusted for heteroskedasticity and correlation across observations for a given firm.

	Completion Rate		
<i>Target</i>	-3.1511*** (-5.30)	-3.4420*** (-5.17)	-3.3689*** (-5.49)
<i>Discount</i> ⁻	-0.2427*** (-4.17)		
<i>Discount</i> [±]		-0.1862** (-2.42)	
<i>Discount</i> ⁺			0.0250 (0.48)
<i>LnSize</i>	0.0130 (0.95)	0.0146 (1.01)	0.0106 (0.81)
<i>B/M</i>	0.0194 (0.41)	0.0110 (0.22)	-0.0021 (-0.05)
<i>CAR</i> (-15,-2)	0.0006 (1.53)	0.0001 (0.11)	-0.0003 (-0.26)
<i>ROA</i>	0.4613 (1.19)	0.5525 (1.45)	0.4763 (1.28)
<i>Debt</i>	0.0050 (0.06)	-0.0014 (-0.02)	0.0362 (0.43)
Const	0.6067*** (2.84)	0.5902*** (2.60)	0.6418*** (3.00)
Pseudo <i>R</i> ²	0.076	0.074	0.072
Observations	2,728	2,784	2,714

*** Significant at the 0.01 level.

** Significant at the 0.05 level.

* Significant at the 0.10 level.

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substantially undervalued relative to before the authorized period. On the other hand, *TARGET* is significantly negatively correlated with completion rate. These results imply that although managers are able to time the market, there is uncertainty about the magnitude of underpricing at the time of announcement. In addition, using *Discount*[±] as the discount measure, we obtain similar results, though the significance level of the coefficient of *Discount*[±] declines slightly.⁽²⁰⁾

We do not find that *Discount*⁺ is significantly correlated with completion rate, indicating that when firms buy back shares, they do not consider the price level after the authorized period. These findings are consistent with the results of subsection 4.2.1., where we find that managers are not able to purchase at low prices relative to the level of prices after the authorized period. These results are to some extent consistent with Ikenberry, Lakonishok, and Vermaelen (2000). These authors show that completion rate is significantly negatively correlated with six-month-prior excess return, which is not significantly correlated with six-month-future excess return, reporting that firms are largely unable to predict future stock prices over relatively short time horizons.

VII. Conclusion

We test the market timing hypothesis using repurchase data. Share repurchase gives managers buyback timing flexibility. If managers have timing ability, they announce share repurchase programs based on recognition of stock price undervaluation.

(20) There is the possibility that *Discount*⁻ and *Discount*[±] are highly correlated with *CAR* (-15, -2). To avoid the possibility that these results are obtained from this factor, we repeat these analyses while excluding *CAR* (-15, -2) and confirm that the results are the same.

The results of the logit regression show that firms tend not to repurchase shares when the magnitude of their stock price undervaluation is not serious. Thus, we perform an event study to analyze whether program-announced firms actually experience significant price drop prior to announcement. Consistent with the managerial timing hypothesis, program-announced firms experience significant price drop before the event, whether or not they actually repurchased.

It is well known that the announcement effect of share repurchase programs is positive. To the extent that the market understands that managers have timing ability, the event would serve as a signal of stock price undervaluation. The results of our event study show that the announcement effect is larger when firms intend to repurchase a lot of shares and the magnitude of underpricing is large. These findings are consistent with the signaling hypothesis, indicating that the market recognizes program announcement as a credible signal that firm stock price is undervalued.

If in response to the announcement, undervaluation is resolved, then firms could no longer purchase their shares at discount prices. Stock price movement of the actually repurchased (not-purchased) group first declines 3% (2%), then rises 3% (2%).

To examine directly the managerial timing hypothesis, we compare average stock price during the authorized period with periods before and after. If managers have timing ability, they buy back more share when their stock price during the authorized period remains largely underpriced. On the other hand, it is thought that they do not purchase shares at all if their stock price undervaluation is resolved in response to program announcement.

The results of a comparison test using the discount measure show that actually repurchased firms execute at significantly discounted prices, but there is

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no significant discount for not-purchased firms. These results are consistent with the managerial timing hypothesis. Nevertheless, our results also show that managers do not purchase shares at the lowest price. We find evidence that stock price continues to decline after the authorized period.

We also examine the relationship between discount measures and the number of bought-back shares. If managers use ability to time the market, then the more stock price is discounted, the more shares they purchase. This finding is supported by Tobit regression results. All our results show that, in Japan, managers are able to time the market in a way similar to managers in other countries. We conclude that managers use share repurchase to take advantage of this flexibility.

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