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### Share Repurchases in Japan

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# **Share Repurchases in Japan**

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## **Abstract**

This paper examines the stock price performance surrounding stock repurchase announcements in Japan. The positive cumulative abnormal return of 2.0% is observed from one day before to thirty days after the announcements. This paper also attempts to distinguish between the agency costs of free cash flow hypothesis and the information signaling hypothesis to explain the market reaction to the announcements. The primary finding is that the repurchase announcements made by low-valuation and small firms receive a stronger positive market reaction. This evidence supports the information signaling hypothesis that stock repurchases send a strong signal to less informed outside investors that the stocks are undervalued. On the other hand, the evidence which supports the agency cost of free cash flow hypothesis is not fully observed.

## **1. Introduction**

Since the mid-1990s, the regulations on stock repurchases have been eased gradually and many Japanese firms have implemented stock repurchase programs. According to Nomura Securities, about 1400 listed firms in Japan implemented stock repurchase programs and the total amount of the programs was about 10 trillion yen in 2002 alone.

It is commonly said that stock repurchase announcements are greeted favorably by markets. The two most widely accepted hypotheses which explain the positive reaction of the market to the stock repurchase announcements are the agency cost of free cash flow hypothesis and the information signaling hypothesis. The information signaling hypothesis argues that stock repurchases send a signal to less informed outside investors that the stocks are undervalued and the company's prospects are improving. The example is the stock repurchase announcements made by U.S. firms after the stock market crash of 1987 (Black Monday). Major U.S. firms such as Citicorp and General Electric announced their intention to buy back their own shares to send a signal to the market that their stocks were undervalued after the market plunged around 20%. These announcements were successful to prevent the market from dropping further. The agency cost of free cash flow hypothesis,

on the other hand, argues that with excess cash managements might invest the cash in unprofitable or negative NPV projects. This, in turn, decreases the firm's value. Since stock repurchases reduce the resources under managers' control by paying excess cash back to shareholders, stock repurchases can mitigate the agency cost of free cash flow.

Zhang (2002) investigates the share price performance surrounding share repurchase announcements in Japan. It is found that there is a statistically significant abnormal return at the announcement about 5%. Further, the abnormal return is positively related to announced repurchase percentage target; negatively related to firm size and prior returns before the repurchase decision is made. It is concluded that the evidence supports the signaling/undervaluation hypothesis. Norhel and Tarhan (1998) examine announcement period returns and operating performance changes surrounding repurchases. Their primary finding is that operating performance following repurchases improves only in low growth firms, and that these gains are generated by more efficient utilization of assets, and asset sales. Also, the announcement-period abnormal returns are significantly higher for low-q firms than high-q firms. It is concluded that the positive market reaction to repurchases is best explained by the free cash flow hypothesis.

The objective of this paper is to examine the reaction of the market to the announcements of implementation of a stock repurchase program and to distinguish between the agency cost of free cash flow hypothesis and the information signaling

hypothesis as explanations of the market reaction. First, this paper examines the market reaction to the announcements of stock repurchase programs. We calculate cumulative abnormal stock returns surrounding stock repurchase announcements and investigate the difference of the market reaction among portfolios partitioned according to the terms of repurchase announcements and the prior returns before the announcements.

Second, in order to distinguish between the agency cost of free cash flow hypothesis and the information signaling hypothesis, we compare the cumulative abnormal returns of two event portfolios which are constructed according to the following financial and market characteristics of sample firms: market to book ratio, price earning ratio, firm size, sales growth, and cash to sales ratio. Market to book ratio, price earning ratio, and firm size are employed for testing the information signaling hypothesis. Market to book ratio (MTB) and price earning ratio (PER) are valuation measures. If the market reacts in accordance with the information signaling hypothesis, the announcements made by low-valuation firms should have larger price impacts surrounding the announcements. Firm size is employed as a proxy for information asymmetries. Since smaller firms are neglected due to information asymmetries by investors, they should receive a positive reaction if the market follows the signaling hypothesis.

The event portfolios based on simple Q, sales growth, and cash to sales ratio are used to test for the free cash flow hypothesis. Simple Q, which is defined as the market

value of equity and book value of debt divided by the book value of total assets (Loderer and Martin 1997), is the most important measure to distinguish between over-investing and under-investing firms relative to the fair investment. Firms with the Q ratios lower than unity are categorized as over-investing firms; hence, the announcements made by them should be received more favorably by the market than high-Q firms. In addition, if the market follows the free cash flow hypothesis, the stock repurchase announcements of low-growth, cash-rich firms should have a larger impact on stock returns.

Finally, cross-sectional regression analyses are employed to distinguish between the two hypotheses and to measure the key determinants of the abnormal returns surrounding stock repurchase announcements. Dependent variables are the cumulative abnormal returns surrounding repurchase announcements. Independent variables are the financial and market characteristics of firms, and the terms of repurchase announcements.

## **2. Description of data and methodologies**

Until 1994, Japanese companies were, in principle, prohibited from buying back their own shares outstanding. However, the regulations of stock repurchases have been eased gradually since the mid-1990s. In 1994, the Commercial Code was changed to allow firms to repurchase shares for cancellation, or for transferring shares repurchased to

employees. A drawback of the revised Commercial Law was that the companies which planned to repurchase their own stocks needed to adopt a resolution at a general shareholders' meeting.

In 1997, the Commercial Law was revised again to allow firms to buy back shares to transfer shares repurchased to employees, directors and statutory auditors as stock options. The ceiling of stocks to be repurchased was expanded from 3% to 10% of the outstanding shares. In addition, the Special Exemption Law for Retirement of Stock was enacted to allow firms to buy back shares in accordance with a resolution at a board meeting if these steps were prescribed in the corporate charters. In 1998, the Special Exemption Law was changed to allow the use of capital reserves for stock repurchases.

The Commercial Code was further revised in 2001 to lift the ban of treasury stocks. The revision enabled firms to retire or hold their repurchased shares regardless of the purposes under the authorization of a regular general shareholders meeting.

The sample consists of the announcements of implementation of stock repurchase programs made by the Nikkei 500 members during the period between 1997 and 2003, which is obtained from the Bloomberg. The data on each stock repurchase announcement is comprised of the company name, the announcement date, and the number of shares to be repurchased. We exclude the announcements made by financial institutions since these firms have different financial structure from non-financial firms.

Each sample corresponds to the announcement to implement a stock repurchase program after a resolution at a board meeting. There are two types of news flows of implementation of the program. First, firms may determine the implementation of a stock repurchase program at a board meeting before a resolution at a general shareholders' meeting. In this case, they need to obtain an approval of a general shareholders' meeting to buy back their own shares. On the other hand, firms implement the program in accordance with a resolution at a board meeting without an approval at a general shareholders' meeting if these steps were prescribed in the corporate charters. In both cases, all announcements made after a board meeting are included.

A total of 1011 announcements are included in the full sample after the final screening. Exhibit 2 presents the number of samples by year and the number of an announcement. We include an announcement into the category of "First Announcements" if the announcement is not made within the authorization period of the previous stock repurchase program. In other words, only if an announcement is made within one year after the implementation of the previous repurchase program, the announcement is categorized as "Others". For the final sample, the stock returns and financial data are obtained from Datastream.

The daily normal return,  $E(r_{jt})$ , is calculated using the market model method using the Tokyo Stock Exchange Price Index (TOPIX) as a market index. The regression is run

over 175 days to 61 days before the stock repurchase announcement, day “0”. A cumulative abnormal return, CAR, is simply the sum of daily abnormal returns over the specified period in the event window. Daily abnormal returns and CARs are calculated for the total sample, and also for the subsamples partitioned according to the following terms of the announced share repurchase programs: the number of shares repurchased, the year of an announcement, and the target shares to be repurchased as a percentage of outstanding shares.

Besides, to distinguish between the information signaling hypothesis and the agency cost of free cash flow hypothesis, we calculate daily abnormal returns and CARs for portfolios partitioned according to the following firms’ financial and market characteristics: simple Q, sales growth, cash to sales ratio, market to book value ratio, price earning ratio, and firm size. Simple Q, sales growth, and cash to sales ratio are used for testing the free cash flow hypothesis, whereas market to book ratio, price earning ratio, and firm size are employed to test for the information signaling hypothesis. Simple Q is defined as the market value of equity and book value of debt divided by the book value of total assets (Loderer and Martin 1997). Sales growth is measured over five years before the fiscal year in which the stock repurchase announcement is made. Firm size is measured as the log of market capitalization. All market data, such as market capitalization, market to book ratio and price earning ratio, is the value on the announcement day. All financial data,

such as book value of debt, assets, cash is the value at the end of the last fiscal year before the announcement.

## **4. Empirical results**

### ***4.1. Abnormal returns surrounding the stock repurchase announcements***

Exhibit 3 shows the daily abnormal returns from day -60 to +60 relative to the announcement day and CARs for each specified event window. Each number in the brackets is the p-values for testing the null hypothesis that the calculated return values differ from zero. Figure 1 provides the CARs from day -60 to +60. The CARs in the figure are calculated so that the CAR on day 0 is equal to zero.

It is found that, on average, the market reacts favorably to the announcements of implementation of a stock repurchase program. Significant daily abnormal returns are observed surrounding the announcement day. All of the daily abnormal returns from day -1 to +2 are positive and statistically significant. The biggest abnormal return is 0.6% on day 1, which is the first trading day after the announcement. Besides, the abnormal returns on day -1 and 0 are also positive. This may indicate the possibility that stock repurchase programs are exposed by the press or leaked to the market before the public announcements.

Of the five event windows in Exhibit 3, significant positive returns are observed from day -1 to +3 and from day +4 to +30. The mean CAR(-1,3) is 1.3% and statistically significant at the 1% level. The CAR(4,30) is also positive and statistically significant at the 5% level; thus, the positive reaction of the market to the stock repurchase announcements continues over about 1 month after the event. Moreover, the mean CAR(-30,-2) is -1.0% and statistically significant. Japanese firms may make the decision of stock repurchases after the drop in their stock prices.

Exhibit 4 presents the CARs for portfolios partitioned according to the terms of repurchase announcements and the prior returns before the announcements. The announced terms examined are the number of an announcement made by each firm, the year of an announcement, and the target shares to be repurchased. The first repurchase announcements show larger CAR(-1,3) and CAR(4,30) than the subsequent repurchase announcements, “Others” (Panel A of Exhibit 4). The difference of the CARs(-1,3) is not statistically significant, whereas the difference of CARs(4,30) is significantly different from zero. It is found that the first repurchase announcements by each firm continue to receive more positive reactions by the market over about 1 month after the event.

Panel B of Exhibit 4 shows the mean CARs in each of the seven years. The CARs(-1,3) for announcements in 1997, 2000, 2001, and 2002 are significantly positive. The CAR(-1,3) in 1997 is 3.9%, which is the biggest positive return during the sample

period. When Japanese firms initiated the repurchase program, the announcements were most favorably accepted by the market. One possible reason for the diminished positive returns is the increase in stock repurchases aimed at unwinding cross-shareholdings. Repurchases of stocks held by financial institutions do not change the number of floating stocks and affect the supply-demand relationship of stocks. Therefore, the market reactions to repurchases may have become smaller as the stock repurchases aimed at unwinding of cross-shareholdings have increased.

Panel C of Exhibit 4 reports CARs of the two portfolios divided according to the target percentage of shares to be repurchased. The mean CAR(-1,3) of high-percentage portfolio is 1.6% while that of low-percentage portfolio is 1.0%. The difference of the CARs(-1,3) between the two portfolios is not significant. The market seems indifferent to the amount of shares to be repurchased.

The CARs of portfolios based on pre-announcement returns are reported in Panels D and E of Exhibit 4. The mean CAR(-60,-31) is 9.3% for the high CAR(-60,-31) portfolio and -9.3% for the low CAR(-60,-31) portfolio. The mean CAR(-30,-2) of the high CAR(-30,-2) portfolio is 8.2% while that of the low CAR(-30,-2) portfolio is -10.3%. The cumulative abnormal returns prior to announcements seem to have no explanatory power for the CAR(-1,3) since the differences of the CARs(-1,3) between the high and low pre-announcement returns are insignificant. The CAR(4,30) and CAR(31,60) of firms with

high pre-announcement returns is higher than those of firms with low-announcement returns. The differences are statistically significant. Thus, the firms with high pre-announcement returns tend to outperform the firms with low pre-announcement returns after the event.

#### ***4.2. The information signaling hypothesis vs. the agency cost of free cash flow hypothesis***

The positive market reaction to the stock repurchase announcements can be explained by the agency cost of free cash flow hypothesis and/or the information signaling hypothesis. The differentiation between the two hypotheses can be possible. We compare the cumulative abnormal returns of two portfolios which are partitioned according to the following financial and market characteristics of sample firms: market to book ratio, price earning ratio, firm size, simple Q, sales growth rate, and cash to sales ratio.

Market to book ratio, price earning ratio, and firm size are employed for testing the information signaling hypothesis. Exhibit 5 presents the CARs for two portfolios partitioned based on these characteristics.

The portfolio of firms with low market to book ratios has higher CARs continuously after the announcement (Panel A of Exhibit 5). The average CAR(-1,3),

CAR(4,30), and CAR(31,60) for the low-valuation firms are 2.2%, 2.4%, and 1.7%, respectively, all of which are significantly different from zero. On the other hand, those for the high-valuation portfolio are 0.4%, -1.0%, and -1.5%, respectively. All p-values for the difference after the announcement are significant. This evidence supports the information signaling hypothesis that stock repurchases represent a signal of undervaluation since low-valuation firms have larger positive returns.

Firms with low PERs have the average CAR(-1,3) of 1.5% whereas firms with high PERs have the average CAR(-1,3) of 1.2% (Panel B of Exhibit 5). The difference is insignificant. Investors are indifferent to the price earning ratio for making their investment decisions.

Firm size has strong explanatory power for the abnormal returns (Panel C of Exhibit 5). The CARs are larger for small firms than large firms in all of the event window specifications after the event and the differences are statistically significant. The average CAR(-1,3), CAR(4,30), and CAR(31,60) for small firms are 2.2%, 2.2%, and 1.7%, respectively, while those for large firms are 0.5%, -0.8%, and -1.5%. Firm size can be a proxy for information asymmetries. Small firms face more information asymmetry problem and, hence, have larger stock price impacts of the repurchase announcements. Thus, the evidence of the larger positive returns for small firms support the information signaling hypothesis.

Simple Q ratio, sales growth rate, and cash to sales ratio are used for testing the agency cost of free cash flow hypothesis. Exhibit 6 reports the CARs for two portfolios partitioned according to these ratios.

It is found that the market responds more favorably to the stock repurchase announcements of firms with lower simple Q ratios than unity, which are categorized as over-investing firms (Panel A of Exhibit 6). The CARs of low-Q firms far exceed those of high-Q firms. The CAR(-1,3) for low-Q firms is 1.8% and highly significant, followed by the significant CAR(4,30) and CAR(31,60) of 1.8% and 1.3%. Positive impacts of the announcements by low-Q firms last for 2 months after the announcements. On the other hand, the CAR(-1,3) for high-Q firms is also positive, but insignificant. The CAR(4,30) and CAR(31,60) of high-Q firms are negative. This result supports the free cash flow hypothesis since the market reacts more to the announcements of over-investing firms, which are thought to have higher agency costs of free cash flow.

The market reacts more favorably to the repurchase announcements of high sales-growth firms (Panel B of Exhibit 6). The mean CAR(-1,3) for low sales-growth firms is 1.0% while that for high sales-growth firms is 1.7%. This result is against the hypothesis that low growth firms have higher agency costs of free cash flow and, thus, the announcements of low growth firms have stronger impacts on stock prices.

The announcements of cash rich firms have weaker impacts on stock prices than

those of cash poor firms (Panel C of Exhibit 6). The mean CAR(-1,3) for firms with high cash to sales ratios is 0.8% while that for firms with low cash to sales ratios is 1.8%. The difference is statistically significant. This evidence is, again, against the agency costs of free cash flow hypothesis since cash rich firms could have higher agency costs.

#### ***4.3. Cross-sectional regression analyses***

Multiple regression analyses are performed in order to measure the key determinants of the abnormal returns surrounding stock repurchase announcements, to distinguish between the information signaling hypothesis and the agency cost of free cash flow hypothesis, and to test for multicollinearity. We employed the terms of the repurchase announcements, the financial and market characteristics of firms, and the cumulative abnormal returns prior to announcements as independent variables.

Exhibit 7 provides descriptive statistics and correlations for the 12 independent variables. The correlation matrix among dependent variables suggests that there are some variables which show high correlation with other variables. Especially, market to book ratio is highly correlated with simple Q. Exhibit 8 reports the regression results. The dependent variables are CAR(-1,3), CAR(-1,30), and CAR(-1,60). Market to book ratio, price earnings ratio, and firm size are the independent variables for testing the information

signaling hypothesis, whereas simple Q, sales growth rate, and cash to sales ratio are the variables which test for the agency cost of free cash flow hypothesis. Keiretsu is added as an independent variable to see the difference of market reaction to the announcements made by keiretsu-affiliated firms and non-keiretsu firms. Keiretsu-affiliated firms mutually hold shares in the keiretsu group. If the market interprets unwinding of cross-shareholdings as a positive signal, the announcements made by keiretsu-affiliated firms would receive a stronger positive reaction than those of independent firms. The samples which have negative price earnings ratio or no Keiretsu data are excluded. The adjusted R-squared for the CAR(-1,60) is the biggest of the three models, which means that the explanatory power of the model increases as the measurement period gets longer.

The regression results support the signaling hypothesis. First, market to book ratio and firm size have negative coefficients and highly significant, meaning that smaller and low-valuation firms have stronger stock price impacts. This evidence indicates that the announcements are a signal to less informed investors that the stock prices are undervalued. Second, most of the independent variables which test for the free cash flow hypothesis are statistically insignificant, including simple Q. Only cash to sales ratio is significant for the regression model with the dependent variable of CAR(-1,3); however, the coefficient is negative, which is inconsistent with the hypothesis.

The followings are the other findings. First, the market is indifferent to whether

the announcements are made by keiretsu-affiliated firms or independent firms. All of the keiretsu coefficients are insignificant. Second, the announcements made in an earlier year have larger positive impacts on stock performance. The date coefficients are all negative and significant. Finally, most of the pre-announcement return coefficients are positively related to the abnormal returns after the announcements. Firms with high pre-announcement returns tend to outperform firms with low pre-announcement returns after the event.

The regression analysis which excludes SimpleQ from the original model is also performed to avoid multicollinearity that likely exists in the original model (Exhibit 9). The results remain unchanged from the original regression results.

Exhibit 10 shows two regression results which compare the two hypotheses. The first regression model employs market to book ratio, price earnings ratio, and firm size as independent variables to test for the information signaling hypothesis. The second one uses simple Q, sales growth rate, and cash to sales ratio as independent variables for testing the agency cost of free cash flow hypothesis.

The former model can explain more the abnormal returns surrounding the repurchase announcements. The R-squared for the first regression model with the dependent variable of CAR(-1,3) is 3.2% while that for testing the free cash flow hypothesis is just 0.3%. The f-statistics for the former model are much larger than those for

the latter model.

In the former regression results, market to book ratio and firm size are negative and significantly different from zero. This evidence is consistent with the information signaling hypothesis. In the latter regression model, only cash to sales ratio is statistically significant, but has negative coefficients, which are inconsistent with the agency cost of free cash flow hypothesis. If the market reacts in accordance with the hypothesis, the announcements of cash rich firms which have higher agency costs of free cash flow have more positive effects on stock prices. The comparison of regression results makes it clear that the positive market reactions to the stock repurchase announcements are explained more by the information signaling hypothesis than the agency cost of free cash flow hypothesis.

Lastly, we conducted regression analyses by employing firm size as the representative variable of the signaling hypothesis and one of the three variables for testing the free cash flow hypothesis as independent variables. Exhibit 11 reports the regression results.

Firm size is statistically highly significant and has negative coefficients for all of the regression results. This evidence strongly supports the information signaling hypothesis. On the other hand, the three independent variables for testing the free cash flow hypothesis have little explanatory power for the abnormal returns surrounding the announcements.

The coefficients of simple Q and sales growth rate are insignificant. Some coefficients of cash to sales ratio are significant but negative. This evidence fails to support the free cash flow hypothesis.

The overall regression results suggest the followings. First, the positive market reactions to the stock repurchase announcements can be explained more by the information signaling hypothesis. The first evidence to support the hypothesis is that the repurchase announcements of low-valuation firms lead to the higher stock returns. Another evidence is a much stronger positive reaction of the market to the announcements of small firms, which face higher information asymmetry problem. Second, the evidence which supports the agency cost of free cash flow hypothesis is not observed. Simple Q, sales growth rate, and cash to sales ratio have little explanatory power for the abnormal returns surrounding stock repurchase announcements in a multiple regression study. Finally, the repurchase announcements in an earlier year have stronger impacts on stock performance.

## **5. Conclusion**

In this paper, we examined the abnormal stock returns surrounding the announcements of stock repurchase programs in Japan. The positive cumulative abnormal return of 2.0% was observed from day -1 to +30 relative to the announcement day. It was

found that the repurchase announcements were received favorably by the stock market.

Besides, this paper attempted to distinguish between the information signaling hypothesis and the agency cost of free cash flow hypothesis to account for the positive market reaction. Both of the hypotheses may be supported by the evidences from the cumulative abnormal returns for the portfolios partitioned according to firms' financial and market characteristics. The signaling hypothesis is supported by the evidence that the announcements of smaller, low-valuation firms have larger positive impacts on stock performance. On the other hand, the free cash flow hypothesis is supported by the evidence that the market reacts more to the announcements of over-investing firms which are measured by the simple Q ratio.

The regression analyses showed somewhat the different results. Of the independent variables which test for the signaling hypothesis, market to book ratio and firm size have strong explanatory power for the abnormal returns surrounding the announcements, whereas the variables for testing the free cash flow hypothesis have little explanatory power. This evidence supports the information signaling hypothesis since the market reacts more favorably to the announcements made by firms with low market to book ratios, and by small firms which have higher information asymmetry. It is concluded that in Japan, the market interprets share repurchase announcements as a signal of managers to less informed outside investors that the stock prices are undervalued.

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## EXHIBIT 2: Full sample

Number of announcements 1,011

Number of firms 317

|                     | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | Total |
|---------------------|------|------|------|------|------|------|------|-------|
| First Announcements | 22   | 48   | 38   | 64   | 59   | 158  | 63   | 452   |
| Others              | 4    | 36   | 42   | 52   | 70   | 135  | 220  | 559   |
| Total               | 26   | 84   | 80   | 116  | 129  | 293  | 283  | 1,011 |

## EXHIBIT 3 Abnormal returns for the full sample

| Event Window |                  |        |             |                  |        |           |                 |        |           |                 |        |            |                |        |
|--------------|------------------|--------|-------------|------------------|--------|-----------|-----------------|--------|-----------|-----------------|--------|------------|----------------|--------|
| (-60,-31)    |                  |        | (-30,-2)    |                  |        | (-1,3)    |                 |        | (4,30)    |                 |        | (31,60)    |                |        |
| Day          | AR               | p      | Day         | AR               | p      | Day       | AR              | p      | Day       | AR              | p      | Day        | AR             | p      |
| -60          | -0.2% (0.02) **  |        | -30         | 0.0% (0.91)      |        | -1        | 0.1% (0.05) **  |        | 4         | 0.1% (0.09) *   |        | 31         | 0.0% (1.00)    |        |
| -59          | 0.0% (0.67)      |        | -29         | -0.2% (0.04) **  |        | 0         | 0.3% (0.00) *** |        | 5         | 0.1% (0.22)     |        | 32         | 0.1% (0.31)    |        |
| -58          | 0.2% (0.04) **   |        | -28         | 0.0% (0.84)      |        | 1         | 0.6% (0.00) *** |        | 6         | 0.0% (0.95)     |        | 33         | 0.0% (0.93)    |        |
| -57          | 0.1% (0.45)      |        | -27         | 0.0% (0.50)      |        | 2         | 0.2% (0.01) **  |        | 7         | 0.0% (0.62)     |        | 34         | 0.0% (0.89)    |        |
| -56          | 0.1% (0.50)      |        | -26         | -0.2% (0.00) *** |        | 3         | 0.1% (0.18)     |        | 8         | 0.0% (0.99)     |        | 35         | -0.1% (0.42)   |        |
| -55          | 0.1% (0.47)      |        | -25         | -0.1% (0.32)     |        |           |                 |        | 9         | 0.0% (0.89)     |        | 36         | 0.1% (0.29)    |        |
| -54          | 0.0% (0.63)      |        | -24         | 0.1% (0.10) *    |        |           |                 |        | 10        | 0.0% (0.95)     |        | 37         | 0.1% (0.14)    |        |
| -53          | 0.0% (0.57)      |        | -23         | -0.1% (0.29)     |        |           |                 |        | 11        | 0.0% (0.51)     |        | 38         | 0.0% (0.53)    |        |
| -52          | -0.1% (0.19)     |        | -22         | -0.1% (0.11)     |        |           |                 |        | 12        | 0.0% (0.89)     |        | 39         | -0.1% (0.09) * |        |
| -51          | -0.1% (0.29)     |        | -21         | 0.1% (0.12)      |        |           |                 |        | 13        | 0.1% (0.20)     |        | 40         | 0.0% (0.70)    |        |
| -50          | -0.1% (0.16)     |        | -20         | 0.0% (0.73)      |        |           |                 |        | 14        | 0.0% (0.60)     |        | 41         | 0.1% (0.11)    |        |
| -49          | 0.0% (0.69)      |        | -19         | -0.1% (0.42)     |        |           |                 |        | 15        | 0.1% (0.09) *   |        | 42         | 0.0% (0.53)    |        |
| -48          | -0.1% (0.51)     |        | -18         | 0.0% (0.72)      |        |           |                 |        | 16        | 0.0% (0.52)     |        | 43         | 0.0% (0.92)    |        |
| -47          | 0.1% (0.11)      |        | -17         | 0.1% (0.35)      |        |           |                 |        | 17        | 0.0% (0.48)     |        | 44         | 0.0% (0.51)    |        |
| -46          | -0.1% (0.17)     |        | -16         | -0.1% (0.42)     |        |           |                 |        | 18        | 0.0% (0.51)     |        | 45         | -0.1% (0.16)   |        |
| -45          | -0.1% (0.22)     |        | -15         | 0.0% (0.73)      |        |           |                 |        | 19        | -0.1% (0.14)    |        | 46         | 0.1% (0.18)    |        |
| -44          | 0.0% (0.67)      |        | -14         | -0.1% (0.46)     |        |           |                 |        | 20        | 0.0% (0.79)     |        | 47         | -0.1% (0.35)   |        |
| -43          | 0.1% (0.39)      |        | -13         | -0.1% (0.08) *   |        |           |                 |        | 21        | -0.1% (0.16)    |        | 48         | 0.0% (0.77)    |        |
| -42          | -0.1% (0.47)     |        | -12         | 0.0% (0.77)      |        |           |                 |        | 22        | 0.1% (0.21)     |        | 49         | 0.0% (0.80)    |        |
| -41          | 0.0% (0.94)      |        | -11         | 0.0% (0.81)      |        |           |                 |        | 23        | 0.3% (0.00) *** |        | 50         | -0.1% (0.13)   |        |
| -40          | -0.2% (0.00) *** |        | -10         | -0.3% (0.00) *** |        |           |                 |        | 24        | 0.0% (0.51)     |        | 51         | 0.0% (0.60)    |        |
| -39          | 0.0% (0.63)      |        | -9          | -0.1% (0.19)     |        |           |                 |        | 25        | 0.2% (0.03) **  |        | 52         | 0.0% (0.59)    |        |
| -38          | -0.1% (0.16)     |        | -8          | -0.1% (0.14)     |        |           |                 |        | 26        | 0.1% (0.29)     |        | 53         | -0.1% (0.32)   |        |
| -37          | 0.1% (0.48)      |        | -7          | -0.1% (0.21)     |        |           |                 |        | 27        | 0.1% (0.23)     |        | 54         | 0.0% (0.95)    |        |
| -36          | 0.2% (0.01) **   |        | -6          | 0.0% (0.85)      |        |           |                 |        | 28        | 0.1% (0.40)     |        | 55         | 0.0% (0.93)    |        |
| -35          | 0.1% (0.36)      |        | -5          | 0.0% (0.90)      |        |           |                 |        | 29        | 0.0% (0.59)     |        | 56         | -0.1% (0.06) * |        |
| -34          | 0.0% (0.67)      |        | -4          | 0.0% (0.78)      |        |           |                 |        | 30        | -0.1% (0.08) *  |        | 57         | 0.1% (0.06) *  |        |
| -33          | 0.1% (0.40)      |        | -3          | 0.0% (0.85)      |        |           |                 |        |           |                 |        | 58         | -0.1% (0.13)   |        |
| -32          | 0.2% (0.04) **   |        | -2          | 0.1% (0.08) *    |        |           |                 |        |           |                 |        | 59         | 0.0% (0.55)    |        |
| -31          | 0.1% (0.23)      |        |             |                  |        |           |                 |        |           |                 |        | 60         | 0.0% (0.78)    |        |
| CAR(-60,-31) | 0.0%             | (0.99) | CAR(-30,-2) | -1.0%            | (0.01) | CAR(-1,3) | 1.3%            | (0.00) | CAR(4,30) | 0.7%            | (0.05) | CAR(31,60) | 0.1%           | (0.88) |

\*\*\*, \*\*, \* indicates mean significantly different from zero at the 1%, 5%, 10% level, respectively.

**EXHIBIT 4**

**Cumulative abnormal returns for portfolios partitioned according to  
the terms of stock repurchase announcements**

|  | (-60,-31)  | (-30,-2)    | (-1,3)      | (4,30)      | (31,60)     |
|--|------------|-------------|-------------|-------------|-------------|
| <i>Panel A: Number of announcement</i> |            |             |             |             |             |
| 1st announcements (N=452)              |            |             |             |             |             |
| CAR                                    | -0.6%      | -1.1%       | 1.6%        | 1.9%        | 0.4%        |
| p-value                                | (0.370)    | (0.101)     | (0.000) *** | (0.001) *** | (0.551)     |
| Others (N=559)                         |            |             |             |             |             |
| CAR                                    | 0.5%       | -1.0%       | 1.1%        | -0.3%       | -0.2%       |
| p-value                                | (0.278)    | (0.037) **  | (0.000) *** | (0.576)     | (0.703)     |
| p-value for difference                 |            |             |             |             |             |
|  | (0.177)    | (0.896)     | (0.158)     | (0.003) *** | (0.482)     |
| <i>Panel B: Year of announcement</i>   |            |             |             |             |             |
| 1997 (N=26)                            |            |             |             |             |             |
| CAR                                    | -0.4%      | -3.3%       | 3.9%        | 2.4%        | 2.2%        |
| p-value                                | (0.874)    | (0.213)     | (0.001) *** | (0.430)     | (0.321)     |
| 1998 (N=84)                            |            |             |             |             |             |
| CAR                                    | 1.2%       | -3.0%       | 0.6%        | 2.8%        | -0.6%       |
| p-value                                | (0.455)    | (0.027) **  | (0.242)     | (0.023) **  | (0.643)     |
| 1999 (N=80)                            |            |             |             |             |             |
| CAR                                    | -2.9%      | -7.1%       | 0.7%        | -0.0%       | 0.2%        |
| p-value                                | (0.054) *  | (0.000) *** | (0.195)     | (0.993)     | (0.922)     |
| 2000 (N=116)                           |            |             |             |             |             |
| CAR                                    | 1.1%       | 4.9%        | 3.1%        | 5.4%        | 5.8%        |
| p-value                                | (0.511)    | (0.001) *** | (0.000) *** | (0.000) *** | (0.001) *** |
| 2001 (N=129)                           |            |             |             |             |             |
| CAR                                    | -2.5%      | -4.8%       | 2.9%        | 0.8%        | -1.5%       |
| p-value                                | (0.030) ** | (0.000) *** | (0.000) *** | (0.418)     | (0.141)     |
| 2002 (N=293)                           |            |             |             |             |             |
| CAR                                    | 0.9%       | -0.5%       | 1.1%        | -0.4%       | -1.5%       |
| p-value                                | (0.175)    | (0.492)     | (0.000) *** | (0.451)     | (0.012) **  |
| 2003 (N=283)                           |            |             |             |             |             |
| CAR                                    | 0.3%       | 0.2%        | 0.2%        | -0.6%       | 0.0%        |
| p-value                                | (0.602)    | (0.745)     | (0.532)     | (0.294)     | (0.953)     |

\*\*\*, \*\*, \* indicates mean significantly different from zero at the 1%, 5%, 10% level, respectively.

#### EXHIBIT 4 (Cont'd)

#### Cumulative abnormal returns for portfolios partitioned according to the terms of stock repurchase announcements

|   | (-60,-31)   | (-30,-2)    | (-1,3)      | (4,30)      | (31,60)     |
|---|-------------|-------------|-------------|-------------|-------------|
| <i>Panel C: Target shares to be repurchased</i> |             |             |             |             |             |
| Large target (N=504, Mean=4.9%, Median=3.8%)    |             |             |             |             |             |
| CAR   | 0.1%        | -0.9%       | 1.6%        | 0.3%        | -0.1%       |
| p-value   | (0.784)     | (0.089) *   | (0.000) *** | (0.491)     | (0.824)     |
| Small target (N=507, Mean=0.9%, Median=0.8%)    |             |             |             |             |             |
| CAR   | -0.1%       | -1.2%       | 1.0%        | 1.1%        | 0.2%        |
| p-value   | (0.828)     | (0.048) **  | (0.000) *** | (0.042) **  | (0.706)     |
| p-value for difference                          |             |             |             |             |             |
|   | (0.732)     | (0.678)     | (0.114)     | (0.290)     | (0.666)     |
| <i>Panel D: CAR(-60,-31)</i>                    |             |             |             |             |             |
| Low CAR(-60,-31) (N=505)                        |             |             |             |             |             |
| CAR   | -9.3%       | -3.1%       | 1.0%        | -0.8%       | -0.8%       |
| p-value   |             | (0.000) *** | (0.000) *** | (0.132)     | (0.186)     |
| High CAR(-60,-31) (N=506)                       |             |             |             |             |             |
| CAR   | 9.3%        | 1.0%        | 1.6%        | 2.2%        | 0.9%        |
| p-value   |             | (0.068) *   | (0.000) *** | (0.000) *** | (0.090) *   |
| p-value for difference                          |             |             |             |             |             |
|   |             | (0.000) *** | (0.124)     | (0.000) *** | (0.034) **  |
| <i>Panel E: CAR(-30,-2)</i>                     |             |             |             |             |             |
| Low CAR(-30,-2) (N=505)                         |             |             |             |             |             |
| CAR   | -2.4%       | -10.3%      | 1.5%        | -0.9%       | -1.9%       |
| p-value   | (0.000) *** |             | (0.000) *** | (0.078) *   | (0.000) *** |
| High CAR(-30,-2) (N=506)                        |             |             |             |             |             |
| CAR   | 2.4%        | 8.2%        | 1.1%        | 2.3%        | 2.0%        |
| p-value   | (0.000) *** |             | (0.000) *** | (0.000) *** | (0.000) *** |
| p-value for difference                          |             |             |             |             |             |
|   | (0.000) *** |             | (0.286)     | (0.000) *** | (0.000) *** |

\*\*\*, \*\*, \* indicates mean significantly different from zero at the 1%, 5%, 10% level, respectively.

**EXHIBIT 5**  
**Cumulative abnormal returns for portfolios**  
**to test for the information signaling hypothesis**

|   | (-60,-31) | (-30,-2)    | (-1,3)      | (4,30)      | (31,60)     |
|---|-----------|-------------|-------------|-------------|-------------|
| <i>Panel A: Market to book ratio</i>      |           |             |             |             |             |
| Low MTB (N=500, Mean=0.9, Median=1.0)     |           |             |             |             |             |
| CAR                                       | -0.3%     | -1.2%       | 2.2%        | 2.4%        | 1.7%        |
| p-value                                   | (0.522)   | (0.022) **  | (0.000) *** | (0.000) *** | (0.002) *** |
| High MTB (N=511, Mean=4.0, Median=2.0)    |           |             |             |             |             |
| CAR                                       | 0.3%      | -0.8%       | 0.4%        | -1.0%       | -1.5%       |
| p-value                                   | (0.590)   | (0.146)     | (0.098) *   | (0.064) *   | (0.008) *** |
| p-value for difference                    |           |             |             |             |             |
|   | (0.410)   | (0.642)     | (0.000) *** | (0.000) *** | (0.000) *** |
| <i>Panel B: Price earning ratio</i>       |           |             |             |             |             |
| Low PER (N=434, Mean=20.2, Median=20.4)   |           |             |             |             |             |
| CAR                                       | 0.3%      | -1.5%       | 1.5%        | 0.9%        | 1.3%        |
| p-value                                   | (0.647)   | (0.007) *** | (0.000) *** | (0.075) *   | (0.017) **  |
| High PER (N=434, Mean=144.8, Median=43.1) |           |             |             |             |             |
| CAR                                       | -0.2%     | -0.5%       | 1.2%        | 0.0%        | -1.3%       |
| p-value                                   | (0.789)   | (0.379)     | (0.000) *** | (0.997)     | (0.026) **  |
| p-value for difference                    |           |             |             |             |             |
|   | (0.618)   | (0.233)     | (0.395)     | (0.222)     | (0.001) *** |
| <i>Panel C: Firm size</i>                 |           |             |             |             |             |
| Small firm (N=505, Mean=5.0, Median=5.0)  |           |             |             |             |             |
| CAR                                       | 0.7%      | -0.5%       | 2.2%        | 2.2%        | 1.7%        |
| p-value                                   | (0.228)   | (0.366)     | (0.000) *** | (0.000) *** | (0.004) *** |
| Large firm (N=506, Mean=5.8, Median=5.7)  |           |             |             |             |             |
| CAR                                       | -0.7%     | -1.5%       | 0.5%        | -0.8%       | -1.5%       |
| p-value                                   | (0.241)   | (0.005) *** | (0.062) *   | (0.120)     | (0.004) *** |
| p-value for difference                    |           |             |             |             |             |
|   | (0.093) * | (0.191)     | (0.000) *** | (0.000) *** | (0.000) *** |

\*\*\*, \*\*, \* indicates mean significantly different from zero at the 1%, 5%, 10% level, respectively.

## EXHIBIT 6

### Cumulative abnormal returns for portfolios to test for the agency cost of free cash flow hypothesis

|  | (-60,-31) | (-30,-2)    | (-1,3)      | (4,30)      | (31,60)     |
|--|-----------|-------------|-------------|-------------|-------------|
| <i>Panel A: Simple Q</i>                           |           |             |             |             |             |
| Simple Q < 1 (N=678, Mean=0.7, Median=0.7)         |           |             |             |             |             |
| CAR  | 0.1%      | -0.9%       | 1.8%        | 1.8%        | 1.3%        |
| p-value  | (0.799)   | (0.050) **  | (0.000) *** | (0.000) *** | (0.010) *** |
| Simple Q > 1 (N=333, Mean=5.3, Median=1.4)         |           |             |             |             |             |
| CAR  | -0.2%     | -1.3%       | 0.3%        | -1.5%       | -2.4%       |
| p-value  | (0.755)   | (0.085) *   | (0.323)     | (0.019) **  | (0.000) *** |
| p-value for difference                             |           |             |             |             |             |
|  | (0.690)   | (0.649)     | (0.000) *** | (0.000) *** | (0.000) *** |
| <i>Panel B: Sales growth rate</i>                  |           |             |             |             |             |
| Low sales growth (N=505, Mean=-1.5%, Median=-0.6%) |           |             |             |             |             |
| CAR  | -0.1%     | -1.7%       | 1.0%        | 0.7%        | -0.2%       |
| p-value  | (0.903)   | (0.001) *** | (0.000) *** | (0.166)     | (0.727)     |
| High sales growth (N=506, Mean=8.1%, Median=5.0%)  |           |             |             |             |             |
| CAR  | 0.1%      | -0.3%       | 1.7%        | 0.8%        | 0.3%        |
| p-value  | (0.912)   | (0.591)     | (0.000) *** | (0.157)     | (0.590)     |
| p-value for difference                             |           |             |             |             |             |
|  | (0.870)   | (0.073) *   | (0.051) *   | (0.884)     | (0.528)     |
| <i>Panel C: Cash/Sales</i>                         |           |             |             |             |             |
| High cash/sales (N=503, Mean=38.6%, Median=29.2%)  |           |             |             |             |             |
| CAR  | 0.3%      | -1.4%       | 0.8%        | 0.1%        | 0.2%        |
| p-value  | (0.622)   | (0.010) **  | (0.002) *** | (0.873)     | (0.703)     |
| Low cash/sales (N=508, Mean=8.5%, Median=8.7%)     |           |             |             |             |             |
| CAR  | -0.3%     | -0.6%       | 1.8%        | 1.3%        | -0.1%       |
| p-value  | (0.623)   | (0.263)     | (0.000) *** | (0.008) *** | (0.872)     |
| p-value for difference                             |           |             |             |             |             |
|  | (0.486)   | (0.296)     | (0.005) *** | (0.081) *   | (0.703)     |

\*\*\*, \*\*, \* indicates mean significantly different from zero at the 1%, 5%, 10% level, respectively.

**EXHIBIT 7**  
**Descriptive statistics and correlations**

| Variable                | Mean  | Median | S.D.  | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11  | 12 |
|-------------------------|-------|--------|-------|------|------|------|------|------|------|------|------|------|------|-----|----|
| 1. Market to book ratio | 2.5   | 1.3    | 23.1  | 1    |      |      |      |      |      |      |      |      |      |     |    |
| 2. Price earnings ratio | 82.5  | 29.0   | 679.5 | .12  | 1    |      |      |      |      |      |      |      |      |     |    |
| 3. Firm size            | 5.4   | 5.3    | 0.5   | .33  | .09  | 1    |      |      |      |      |      |      |      |     |    |
| 4. Simple Q             | 2.2   | 0.8    | 27.2  | .87  | .09  | .25  | 1    |      |      |      |      |      |      |     |    |
| 5. Sales growth rate    | 3.3%  | 2.0%   | 9.4%  | .38  | .07  | .09  | .32  | 1    |      |      |      |      |      |     |    |
| 6. Cash to sales ratio  | 23.5% | 15.1%  | 26.1% | .07  | -.04 | .05  | .24  | -.02 | 1    |      |      |      |      |     |    |
| 7. Keiretsu             |       |        |       | -.10 | -.02 | .17  | -.15 | -.13 | -.22 | 1    |      |      |      |     |    |
| 8. Number               |       |        |       |      | .05  | .06  | -.08 | .05  | -.01 | .01  | -.01 | 1    |      |     |    |
| 9. Date                 |       |        |       |      |      | .10  | .02  | -.06 | -.12 | -.05 | -.03 | -.06 | -.23 | 1   |    |
| 10. Target              | 2.9%  | 2.0%   | 3.0%  | -.14 | -.01 | -.15 | -.14 | -.08 | .02  | -.08 | .02  | .34  | 1    |     |    |
| 11. CAR(-60,-31)        | 0.0%  | 0.2%   | 12.4% | -.09 | -.02 | -.05 | -.09 | -.04 | -.06 | .13  | -.04 | .01  | -.02 | 1   |    |
| 12. CAR(-30,-2)         | -1.0% | -1.4%  | 12.5% | -.00 | -.22 | -.05 | -.04 | .01  | -.08 | .02  | .00  | .07  | .02  | .24 | 1  |

"Keiretsu" and "Number" are dummy variables. "Keiretsu" = 1 when a firm is keiretsu-affiliated. "Number" = 1 when an announcement is the first announcement for a firm within one year. "Date" is the serial number of the day on which an announcement is made. CAR(x,y) represents the cumulative abnormal returns from day x to day y.

**EXHIBIT 8**  
**Regression results**

Method: Least Squares

Sample(adjusted): 2 1011

Included observations: 851

Excluded observations: 159 (Negative PERs, No Keiretsu data)

| Dependent variable           | CAR(-1,3)          | CAR(-1,30)         | CAR(-1,60)         |
|------------------------------|--------------------|--------------------|--------------------|
| <u>Independent variables</u> |                    |                    |                    |
| Constant                     | 0.454 (0.001)      | 1.452 (0.000)      | 2.322 (0.000)      |
| Market to book ratio         | -0.008 (0.008) *** | -0.017 (0.010) *** | -0.027 (0.005) *** |
| Price earnings ratio         | -0.000 (0.750)     | 0.000 (0.333)      | 0.000 (0.107)      |
| Firm size                    | -0.012 (0.002) *** | -0.026 (0.003) *** | -0.043 (0.001) *** |
| Simple Q                     | 0.007 (0.161)      | 0.004 (0.680)      | -0.005 (0.729)     |
| Sales growth rate            | 0.000 (0.189)      | 0.001 (0.110)      | 0.001 (0.192)      |
| Cash to sales ratio          | -0.000 (0.030) **  | -0.000 (0.277)     | -0.000 (0.886)     |
| Keiretsu                     | -0.000 (0.984)     | 0.004 (0.670)      | -0.011 (0.455)     |
| Number                       | 0.002 (0.644)      | 0.017 (0.062) *    | 0.017 (0.202)      |
| Date                         | -0.000 (0.005) *** | -0.000 (0.000) *** | -0.000 (0.000) *** |
| Target                       | 0.001 (0.460)      | -0.001 (0.485)     | -0.003 (0.139)     |
| CAR(-60,-31)                 | 0.047 (0.004) ***  | 0.240 (0.000) ***  | 0.355 (0.000) ***  |
| CAR(-30,-2)                  | -0.033 (0.052) *   | 0.155 (0.000) ***  | 0.338 (0.000) ***  |
| R-squared                    | 0.064              | 0.160              | 0.205              |
| Adjusted R-squared           | 0.050              | 0.148              | 0.193              |
| F-statistic                  | 4.752 (0.000) ***  | 13.314 (0.000) *** | 17.977 (0.000) *** |

\*\*\*, \*\*, \* indicates mean significantly different from zero at the 1%, 5%, 10% level, respectively.

**EXHIBIT 9**  
**Regression results (Reduced: A)**

Method: Least Squares

Sample(adjusted): 2 1011

Included observations: 851

Excluded observations: 159 (Negative PERs, No Keiretsu data)

| Dependent variable           | CAR(-1,3)          | CAR(-1,30)         | CAR(-1,60)         |
|------------------------------|--------------------|--------------------|--------------------|
| <u>Independent variables</u> |                    |                    |                    |
| Constant                     | 0.465 (0.000)      | 1.460 (0.000)      | 2.313 (0.000)      |
| Market to book ratio         | -0.005 (0.005) *** | -0.015 (0.000) *** | -0.030 (0.000) *** |
| Price earnings ratio         | -0.000 (0.739)     | 0.000 (0.335)      | 0.000 (0.106)      |
| Firm size                    | -0.013 (0.001) *** | -0.026 (0.003) *** | -0.043 (0.001) *** |
| Sales growth rate            | 0.000 (0.192)      | 0.001 (0.110)      | 0.001 (0.191)      |
| Cash to sales ratio          | -0.000 (0.071) *   | -0.000 (0.313)     | -0.000 (0.784)     |
| Keiretsu                     | -0.000 (0.926)     | 0.004 (0.686)      | -0.010 (0.465)     |
| Number                       | 0.002 (0.640)      | 0.017 (0.062) *    | 0.017 (0.203)      |
| Date                         | -0.000 (0.004) *** | -0.000 (0.000) *** | -0.000 (0.000) *** |
| Target                       | 0.000 (0.499)      | -0.001 (0.473)     | -0.003 (0.143)     |
| CAR(-60,-31)                 | 0.047 (0.004) ***  | 0.240 (0.000) ***  | 0.355 (0.000) ***  |
| CAR(-30,-2)                  | -0.034 (0.044) **  | 0.154 (0.000) ***  | 0.339 (0.000) ***  |
| R-squared                    | 0.062              | 0.160              | 0.205              |
| Adjusted R-squared           | 0.049              | 0.149              | 0.194              |
| F-statistic                  | 4.999 (0.000) ***  | 14.524 (0.000) *** | 19.621 (0.000) *** |

\*\*\*, \*\*, \* indicates mean significantly different from zero at the 1%, 5%, 10% level, respectively.

**EXHIBIT 10**  
**Regression results (Reduced: B)**

Method: Least Squares

Sample(adjusted): 2 1011

Included observations: 868

Excluded observations: 142 (Negative PERs)

| Dependent variable           | CAR(-1,3)          | CAR(-1,30)         | CAR(-1,60)         |
|------------------------------|--------------------|--------------------|--------------------|
| <u>Independent variables</u> |                    |                    |                    |
| Constant                     | 0.092 (0.000)      | 0.199 (0.000)      | 0.332 (0.000)      |
| Market to book ratio         | -0.004 (0.002) *** | -0.012 (0.000) *** | -0.024 (0.000) *** |
| Price earnings ratio         | 0.000 (0.862)      | -0.000 (0.953)     | 0.000 (0.991)      |
| Firm size                    | -0.013 (0.000) *** | -0.029 (0.001) *** | -0.050 (0.000) *** |
| R-squared                    | 0.035              | 0.040              | 0.064              |
| Adjusted R-squared           | 0.032              | 0.037              | 0.060              |
| F-statistic                  | 10.529 (0.000) *** | 11.973 (0.000) *** | 19.556 (0.000) *** |

Method: Least Squares

Sample: 1 1011

Included observations: 1011

| Dependent variable           | CAR(-1,3)         | CAR(-1,30)        | CAR(-1,60)       |
|------------------------------|-------------------|-------------------|------------------|
| <u>Independent variables</u> |                   |                   |                  |
| Constant                     | 0.017 (0.000)     | 0.032 (0.000)     | 0.036 (0.000)    |
| Simple Q                     | -0.000 (0.268)    | -0.000 (0.218)    | -0.000 (0.163)   |
| Sales growth rate            | -0.000 (0.806)    | -0.001 (0.135)    | -0.001 (0.127)   |
| Cash to sales ratio          | -0.000 (0.034) ** | -0.000 (0.016) ** | -0.000 (0.068) * |
| R-squared                    | 0.006             | 0.009             | 0.007            |
| Adjusted R-squared           | 0.003             | 0.006             | 0.004            |
| F-statistic                  | 2.012 (0.111)     | 2.993 (0.030) **  | 2.266 (0.079) *  |

\*\*\*, \*\*, \* indicates mean significantly different from zero at the 1%, 5%, 10% level, respectively.

**EXHIBIT 11**  
**Regression results (Reduced: C)**

Method: Least Squares

Sample: 1 1011

Included observations: 1011

| Dependent variable           | CAR(-1,3)          | CAR(-1,30)         | CAR(-1,60)         |
|------------------------------|--------------------|--------------------|--------------------|
| <b>Independent variables</b> |                    |                    |                    |
| Constant                     | 0.103 (0.000)      | 0.266 (0.000)      | 0.453 (0.000)      |
| Firm size                    | -0.017 (0.000) *** | -0.045 (0.000) *** | -0.080 (0.000) *** |
| Simple Q                     | -0.000 (0.147)     | -0.000 (0.242)     | -0.000 (0.176)     |
| R-squared                    | 0.025              | 0.034              | 0.044              |
| Adjusted R-squared           | 0.023              | 0.032              | 0.042              |
| F-statistic                  | 13.111 (0.000) *** | 17.517 (0.000) *** | 23.159 (0.000) *** |
| <b>Independent variables</b> |                    |                    |                    |
| Constant                     | 0.102 (0.000)      | 0.262 (0.000)      | 0.447 (0.000)      |
| Firm size                    | -0.017 (0.000) *** | -0.045 (0.000) *** | -0.078 (0.000) *** |
| Sales growth rate            | 0.000 (0.574)      | -0.000 (0.501)     | -0.000 (0.561)     |
| R-squared                    | 0.024              | 0.033              | 0.043              |
| Adjusted R-squared           | 0.022              | 0.031              | 0.041              |
| F-statistic                  | 12.195 (0.000) *** | 17.044 (0.000) *** | 22.376 (0.000) *** |
| <b>Independent variables</b> |                    |                    |                    |
| Constant                     | 0.103 (0.000)      | 0.267 (0.000)      | 0.452 (0.000)      |
| Firm size                    | -0.016 (0.000) *** | -0.044 (0.000) *** | -0.078 (0.000) *** |
| Cash to sales ratio          | -0.000 (0.053) *   | -0.000 (0.028) **  | -0.000 (0.117)     |
| R-squared                    | 0.027              | 0.037              | 0.045              |
| Adjusted R-squared           | 0.025              | 0.035              | 0.043              |
| F-statistic                  | 13.957 (0.000) *** | 19.306 (0.000) *** | 23.485 (0.000) *** |

\*\*\*, \*\*, \* indicates mean significantly different from zero at the 1%, 5%, 10% level, respectively.

**Figure 1**  
Cumulative abnormal return for full sample

