Review of Quantitative Finance and Accounting
https://doi.org/10.1007/s11156-024-01296-y

ORIGINAL RESEARCH

Stock buybacks and growth opportunities

Naresh Gopal[1] · Ravi S. Mateti[2] · Duong Nguyen[3] · Gopala Vasudevan[3]

Accepted: 9 May 2024

Abstract
This study examines the role of growth opportunities on stock buybacks and provides evidence on the importance of signaling and agency theories in explaining stock buybacks. Both theories are required to fully explain stock buybacks. As per the signaling theory, we find that the announcement period returns are positive for stock buybacks, which indicates that the buyback firms' stock is undervalued. Furthermore, consistent with agency theory, we also find that the announcement period returns are higher for firms with low growth opportunities and high free cash flow. We also examine buyback firms' long-run stock price performance for 12 months, 24 months, and 36 months following the buyback. We use the Fama–French five-factor model to study the long-run stock performance of buyback firms because of its better explanatory power than the three-factor model. Low growth-high free cash flow firms tend to outperform their benchmark portfolios during this period. Recent regulations such as the Stock Buyback Tax can discourage low growth firms from conducting stock buybacks, which could increase agency costs.

Keywords Stock buybacks · Growth opportunities

JEL Classification G300

✉ Duong Nguyen
dnguyen2@umassd.edu

Naresh Gopal
naresh@iimtrichy.ac.in

Ravi S. Mateti
ravi.mateti@concordia.ca

Gopala Vasudevan
gvasudevan@umassd.edu

[1] Indian Institute of Management Tiruchirapalli, Tiruchirapalli, India

[2] Concordia University, Quebec, Canada

[3] University of Massachusetts Dartmouth, Dartmouth, MA, USA

Published online: 24 June 2024

1 Introduction

U.S. stock buybacks are expected to surpass $1 trillion in 2025.[1] Buybacks have picked up because the 2017 Tax Cuts and Jobs Act reduced corporate taxes to 20%, leaving firms with surplus cash. This act also taxes profits made overseas even if they are not repatriated to the U.S. This reduced the incentive of firms to leave cash overseas, resulting in large inflows of cash back to the U.S. and thereby adding to the surplus cash of the firms. This large amount of money partly financed stock buybacks, which has attracted the attention of academicians, practitioners, and the general public. Blouin and Krull (2009) and Dharmapala et al. (2011) examine the use of repatriated funds under the American Jobs Creation Act of 2004 and conclude that 50% to 90% of these funds were used for shareholder payments, mostly in the form of stock buybacks.

Empirical studies starting with Dann (1981) and Vermaelen (1981) have found that the market reacts positively to announcements of stock buybacks. These studies also find that the stock price performance of buyback firms is significantly better than their matched counterparts after the buyback announcement. Several theories explain these phenomena. According to the signaling theory, the market reacts positively to buyback announcements because the buybacks signal that the shares are undervalued. The agency theory of free cash flow suggests that if firms use their surplus free cash flows to buy back their shares, managers have fewer resources to waste on unproductive investments that reduce the firm value.

Empirical studies have found conflicting evidence on the performance of firms following stock buybacks. Ikenberry et al. (1995) find that stock buyback firms tend to outperform their benchmarks following the buyback. However, Eberhart and Siddique (2004) find that buyback firms do not have abnormal stock price performance after the buyback. Liu and Swanson (2016) find that stock repurchases may be used to provide price support for the stock.

Lazonick (2014) argues that stock-based executive compensation and pressure from blockholders can influence managers to use cash to buy back their firm's shares rather than invest in productive assets. Similar comments have also come from practitioners: Laurence Fink, the chairman, and CEO of BlackRock, the world's largest asset manager, wrote in an open letter to corporate America in March 2014, "It concerns us that, in the wake of the financial crisis, many companies have shied away from investing in the future growth of their companies." Carl Icahn, chairman of Icahn Enterprises, said on CNBC, "Too many companies have cut capital expenditure and even increased debt to boost dividends and increase share buybacks. I am the first to say that there are too many buybacks, by the way. I think that many companies are doing buybacks rather than put money into much-needed capital improvements."

Politicians and lawmakers from both parties have argued against stock buybacks. As a result, on August 16, 2022, the Inflation Reduction Act of 2022 (the "*IRA*") was enacted into law. Among other changes to the Internal Revenue Code of 1986, the IRA imposed a 1% excise tax on repurchases of corporate stock by publicly traded corporations (the "*Stock Buyback Tax*") after December 31, 2022. The Stock Buyback Tax was a last-minute addition to the IRA to replace revenue lost by the elimination of the previously proposed changes to the carried interest rules. It is intended to penalize corporations for engaging in what has become a common means of returning capital to shareholders.[2] Furthermore, in

[1] US Stock Buybacks to Hit $1 Trillion in 2025, Goldman Says, Bloomberg, March 7, 2024.

[2] https://www.velaw.com/insights/inflation-reduction-act-of-2022-excise-tax-on-repurchases-of-corporate-stock-and-interesting-applications-to-spacs/

his State of the Union address in February 2023, President Joe Biden proposed raising the stock buyback from 1 to 4%.

However, proponents of stock buybacks argue that buybacks increase efficiency and allow wealth transfer from firms with fewer growth opportunities to those with more growth opportunities. Damodaran (2019) states, "Where did the $800 billion of cash used for buybacks in the last year go? That money didn't just disappear; shareholders typically use their returns to invest elsewhere in the market. So, it is not that companies are investing less; it's that different companies are investing." Steven Davis (2019) states, "Trapping resources in larger and older businesses not only inhibits the overall size of the pie but also tends to reinforce the unequal distribution of the pie."

This study examines the role of growth opportunities in stock buybacks. Stock buybacks may not necessarily be bad for firms and investors. Growth opportunities determine how much value is created or destroyed by stock buybacks. Stock buybacks by mature firms with few growth opportunities and firms with surplus free cash flows may benefit their shareholders since they can invest the money returned more profitably elsewhere. On the other hand, stock buybacks by firms with many growth opportunities are likely to decrease the firm value, because these firms should be using the available money to finance their growth opportunities rather than returning it to their shareholders.

We report several results that add to the literature. First, our finding that stock buybacks by firms with low growth opportunities and high free cash flow create the most value has not been documented before. Our cross-sectional regressions further substantiate that the announcement period returns are the highest for firms with low growth opportunities and high free cash flows. Our second finding on the abnormal long-term performance of low growth-high free cash flow firms is also new. Low growth firms with high free cash flow tend to outperform the market for three years following stock buybacks. These buyback firms have average monthly excess returns of 1.21%, 0.83%, and 0.92% for years one, two, and three, respectively.

The third contribution of our study is that we provide evidence on the relative importance of the signaling and agency theories in explaining returns due to stock buybacks. Consistent with the signaling theory, the overall returns are positive and significant. However, our finding that the returns are highest for low growth-high free cash flow firms offers strong support for the agency theory.

Fourth, our study offers practical insights to investors. Investors should not view all stock buybacks as giving the same positive signals to buy the shares. Instead, investing in a portfolio of low growth-high free cash flow firms can give the highest returns to investors from stock buybacks. These excess returns can persist for up to three years following the stock buyback.

Fifth, our study offers insights to lawmakers and does not lend support to some recent regulations such as the Stock Buyback Tax, which penalizes all firms that conduct stock buybacks. Penalizing all stock buybacks with this tax will discourage firms with surplus cash but low growth opportunities from returning the cash to their shareholders through stock buybacks. This will only increase the opportunities of managers to invest in value-reducing projects.

Our results strongly support the agency theory explanation of stock buybacks. Consistent with the agency theory, the announcement period returns are higher for firms with low growth opportunities and high free cash flow.

In Sect. 2, we describe the related literature. In Sect. 3, we describe our sample and research methods. In Sect. 4, we discuss the results. In Sect. 5, we summarize and conclude the paper.

2 Review of literature and hypotheses development

Dividends and stock buybacks are two forms of corporate payouts. Many firms use them as complementary forms of payouts rather than as substitutes. However, dividends tend to be sticky, but stock buybacks are flexible (Brav et al. 2005). Firms tend to make dividend payments from permanent earnings but buy back stocks from transitory earnings (Guay and Harford 2000; Jagannathan et al. 2000; Lee and Suh 2011). Kahle and Stulz (2021) find that corporate payouts were very high in the 2000s, and the rapid increase in corporate payouts is driven solely by stock buybacks. The rise in popularity of stock buybacks has increased the financial flexibility of firms and has also increased the overall payout of firms (Allen and Michaely 2003).

Critics of stock buybacks worry that these corporate payouts leave firms with less resources and hurt investment, making employees worse off. Therefore, they advocate tax on stock buybacks to make firms retain surplus cash and increase investments that would benefit workers. However, Asness et al. (2018), Fried and Wang (2018), and Edmans (2017) do not find a negative relationship between stock buybacks and investment. DeAngelo (2023) argues that a tax on stock buybacks would actually be counterproductive and hurt investment. The reason is that investors would be discouraged from supplying capital if they have to bear tax penalties on payouts on their investments. The firms that would be most hurt because of stock buyback tax are growth firms, which need a lot of capital for their growth.

A large amount of literature has examined the information conveyed by stock buybacks. Past research shows that buyback announcements in the U.S. have positive announcement period returns of about 3% on average and long-run abnormal returns of about 30% over three to four years after buybacks (e.g., Ikenberry et al. 1995; Peyer and Vermaelen 2009; Jakob and Valta 2023; Wang et al. 2023). Three theories can explain the stock price reaction to stock buybacks. The first explanation comes from the signaling theory (e.g., John and Williams 1985), the second from the agency/free cash flow theory (Jensen 1986), and the third from the capital structure theory (e.g., Dittmar 2000; Lie 2002). The signaling theory states that managers repurchase their firm's shares when they are undervalued; this action conveys to the market that the firm's profitability and growth opportunities are better than what the market thinks. Hence, outsiders revise their expectations upward when firms announce buybacks (Jia et al. 2024; Campbell et al. 2024). However, it has been reported in some studies that in the 2000s stock buybacks sent weaker undervaluation signals than in the 1980s and 1990s (Allen and Michaely 2003; Farre-Mensa et al. 2014; Bonaimé and Kahle 2024). Although Brav et al. (2005) reject that firms engage in stock buybacks to provide undervaluation signals, CFOs themselves say that taking advantage of undervalued stock prices is the most important reason (Bonaimé and Kahle 2024).

The agency theory argues managers waste surplus cash by engaging in empire-building activities, mostly investing in negative NPV projects. Hence, large investors or the board of directors can pressurize managers to return excess cash to shareholders through dividends or stock buybacks, thereby reducing the money available to managers to indulge in wasteful expenditure. John et al. (2011) find that firms with greater agency costs of free cash

flow tend to make larger payouts. Stock buyback is a way of distributing excess cash by firms across nations (Saxena and Sahoo 2023).

A third explanation based on capital structure theory states that underleveraged firms repurchase stock to change to a more optimal capital structure. One implication of this theory is that stock buybacks may increase a firm's default risk and harm bondholder wealth. Maxwell and Stephens (2003) report that part of the shareholders' wealth gains around a buyback announcement is attributable to a wealth transfer from the bondholders to shareholders. However, Alderson et al. (2020) find no evidence of the wealth transfer effects of stock buybacks. Jun et al. (2009) disentangle the potential negative wealth-transfer effects from bondholders to shareholders from the positive signaling effect.

Signaling theory says that buybacks inform outsiders that the firm is undervalued. Hence, the market should react positively to buyback announcements. The agency theory predicts that stock buybacks by low growth, high free cash flow firms create the most value. Besides the signaling aspect of stock buybacks, buybacks by these firms will force the managers to pay out excess cash holdings to shareholders and thereby reduce the ability of managers to invest in negative net present value projects. Hence, consistent with the agency theory, we expect buybacks by low-growth, high-free cash-flow firms to create the most value.

Besides examining the announcement-period returns, we also examine the post-buyback long-run holding period returns. Daniel et al. (2002) propose the under-reaction hypothesis. They show that subsequent abnormal performance will likely continue in the direction of the announcement period returns. Studies have shown that long-run abnormal returns of stock buyback firms (Michaely et al. 1995; Ikenberry et al. 1995; Peyer and Vermaelen 2009; Manconi et al. 2019).

However, recent studies such as Obernberger (2014), Fu and Huang (2016), Lee et al. (2020) report a decline in long-run post-announcement period returns. This has been attributed to increased institutional ownership, decreased trading costs, improved liquidity, and enhanced regulations regarding corporate governance and information disclosure (Bonaimé and Kahle 2024). Lee et al. (2020) conclude that the decrease in long-run returns is because buybacks are no longer motivated by fundamental factors like undervaluation but rather by non-fundamental factors like managerial self-interest and pressures from short-term oriented institutional investors. Our Hypothesis 3 examines whether low Q-high free cash flow buyback firms will have better long-run stock performance following the buyback, consistent with the under-reaction hypothesis.

We develop the following hypotheses based on our earlier arguments.

Hypothesis 1: *The announcement period returns are positive for stock buybacks (Signaling Theory)*

The signaling theory says that managers of firms are better informed than outside investors regarding the firm's growth opportunities and future cash flows. Hence, the managers will buy back shares when they believe that their firm's shares are trading at a discount to their intrinsic value. The outside investors will revise their expectations of the stock upwards on announcements of stock buybacks. The signaling theory predicts that all buyback announcements convey positive information about the firm value and stock price.

Hypothesis 2: *The announcement period returns are higher for stock buyback firms with low growth opportunities and high free cash flows (Agency Theory)*

The agency theory posits a conflict of interest between managers and shareholders. Managers with excess cash tend to make value-reducing investments. These opportunities would be higher in firms with fewer growth opportunities, and retaining this cash within the firm has the risk of being misused or wasted on unprofitable projects. Therefore, when low growth firms buy back their stock, the market perceives this action to be in the best interest of its shareholders and reacts positively. The agency theory further predicts that opportunities to invest in value-reducing investments would be the highest for firms with low growth opportunities and significant amounts of free cashflows. Hence, the market reaction to announcements of stock buybacks would be the highest for these firms.

Hypothesis 3: *Firms with low growth opportunities and high free cash flows have positive abnormal stock price performance following the buyback (Market Underreaction Theory)*

Behavioral theories argue that the announcement of corporate events may not fully convey the information in these events, and thereby the market can underreact to these announcements. Daniel et al. (2002) propose the underreaction hypothesis. In their model, the market does not fully absorb the implications of the news at the time of announcement, and abnormal performance may continue in the direction of the announcement period returns. The underreaction hypothesis would predict that low growth- high free cash flow firms will continue to have abnormal stock price performance following the buyback announcement.

3 Data and research methodology

US corporations frequently buy back their shares, and the value of buybacks has increased. For this study, the data relating to the share buyback announcements, actual repurchases, share prices, operating performance, the purpose of repurchases, and the status of repurchases were collected from the Securities Data Corporation (SDC), Center for Research in Security Prices (CRSP), and COMPUSTAT / Wharton Research Data Services (WRDS) for the period 1986 to 2018. The sample includes manufacturing, trade, services, and natural resources firms. To identify the determinants of stock buyback returns, we consider the stock prices and various measures of operating performance, like EBITDA and free cash flows.

3.1 Announcement period returns

We examine how stock prices react to announcements of stock buybacks and calculate the daily abnormal returns using Brown and Warner's standard event study method (1985). Average daily abnormal returns are computed in a two-step procedure using stock price data from the CRSP. We report the results using the CRSP value-weighted index as a market proxy.

First, we estimate the parameters of the single-factor market model for each firm. We use the returns from day 255 to day –46 to estimate the firm's alpha and beta coefficients. Then, we estimate the firm's excess daily return by subtracting its expected daily return from its actual daily return. Cumulative abnormal returns are calculated by summing the daily abnormal returns from day –1 to day+1, where day 0 is the day of announcement of the stock

buyback. Similarly, we calculate cumulative abnormal returns for the intervals -5 to + 1, -10 to + 2, and -10 to + 10.

We first examine the announcement period returns for the entire sample. We then divide the sample into quartiles based on Tobin's Q. We further divide firms in each Tobin's Q quartile into two groups based on their free cash flow to total assets ratio (low free cash flow and high free cash flow firms). The free cash flow hypothesis predicts that the announcement period returns would be the highest for firms in the lowest quartile for Tobin's Q and the top group for high free cash flow.

We use cross-sectional regressions to examine the relationship between the stock price reaction to stock buyback announcements and firm variables. We use several independent variables in our study. In developing these variables, we use values of accounting variables at the most recent fiscal year-end before the buyback announcement. The independent variables we use in our analysis are:

Free Cash Flow/Assets: We define free cash flow as (OI – TAX—INT EX – PFDIV -COMDIV) where: OI = Operating Income Before Depreciation
TAX = Total Taxes
INT EX = Interest Expense on Debt
PFDIV = Dividends paid to preferred stockholders
COM DIV = Dividends paid to Common Stockholders
Tobin's Q = (Market value of equity + Book value of debt)/(Book value of assets). This is a proxy for Tobin's Q and has been used by Jung et al. (1996) and Lang et al. (1991), among others.
Low Q Firm: We define a firm as a Low Q if the its Tobin's Q is in the lowest quartile of the sample.
High Free Cash Flow Firm: We define a firm as a High Free Cash flow firm if it is in the top group of Free Cash Flow to total assets ratio in any of the Tobin's Q quartiles.
LowQ-High FCF: We define a firm as LowQ-High FCF firm if it is in the lowest quartile of Tobin's Q and the top group of Free Cash flow. This is dummy variable.
EBITDA/Assets: This variable is the (Earnings before Interest, Taxes, and Depreciation Scaled by the Book Value of Assets.
Stock Buyback Size: This is the value of shares bought back scaled by the market value of equity.
Firm Size: The firm size is calculated as the Log (Total Assets).

The regression equation with the above independent variables is as follows. The dependent variable is the cumulative average abnormal return in different event windows. We have a different regression for each event window we study.

$$\begin{aligned} \text{CAAR} = {} & b_0 + b_1{}^{*}\text{EBITDA/Book value of asset} + b_2{}^{*}\text{Firm size} \\ & + b_3{}^{*}\text{Buyback size/market value} + b_4{}^{*}\text{FCF/Assets} \\ & + b_5{}^{*}\text{LowQ} - \text{HighFCF Dummy} + e \end{aligned}$$

The agency cost of free cash flow predicts a positive coefficient for the Free Cash Flow/Assets variable. Firms with high free cash flow could waste resources on unprofitable projects. Therefore, returning cash to shareholders through stock buybacks helps avoid this problem, and this cash can be used for other investments outside the firm. When high free cash flow firms also have fewer growth opportunities, the problem becomes more severe, and the benefit of stock buybacks increases. The interests of the shareholders are

best served by returning surplus cash to them in the form of stock buybacks. Therefore, we expect a positive coefficient for the Low Q-High FCF dummy variable. We expect a negative coefficient for the EBITDA/Assets variable. The market would prefer that firms with higher operating performance reinvest the cash rather than return it to shareholders through stock buybacks. We expect a positive coefficient for the size of the buyback variable because the buyback would decrease the number of shares and increase the earnings per share. Comment and Jarrell (1991) find that the stock buyback announcement period returns are positively correlated with the percent of outstanding shares repurchased. The percentage of outstanding shares repurchased is likely an indication of the degree of undervaluation of the firm's stock.

We expect a negative coefficient for firm size. Larger firms tend to have more analysts following them, and therefore more public information is available about them. Hence, the incremental information conveyed by stock buyback announcements for these firms would be lower.

3.1.1 Long run stock price performance

Besides examining the announcement-period returns, we also examine the post-buyback long run holding period returns. In this section, we analyze the long-run stock price performance of buyback firms. Daniel et al. (2002) propose the under-reaction hypothesis. They show that subsequent abnormal performance will likely continue in the direction of the announcement period returns. Our Hypothesis 3 states that low Q-high free cash flow buyback firms will have a positive long run abnormal stock performance following the buyback. In this part of our study, we examine whether the long run stock price performance of the buyback firms is consistent with the market efficiency hypothesis, the under-reaction hypothesis, or the overoptimism hypothesis.

Fama (1998) finds that the buy-and-hold abnormal return method for measuring long-run stock returns is problematic because it needs to account for potential cross-sectional return dependence. To address this problem, we estimate abnormal returns using the calendar-time portfolio approach used by Mitchell and Stafford (2000).

A portfolio of equally weighted firms is formed each month in calendar time. Sample firms are included in the portfolio if the sample firm event month for the buyback is in the prior m months. We use the Fama–French five-factor model for $m = 12$, 24, and 36 months or 1, 2, and 3 years:

$$R_{i,t} - R_{f,t} = \alpha + b\left(R_{M,t} - R_{f,t}\right) + sSMB_t + hHML_t + rRMW_t + cCMA_t + \varepsilon_{i,t}$$

where in time period t, $R_{i,t}$ is the return of firm i; R_{ft} is the one-month Treasury-bill rate; $R_{m,t}$ is the CRSP weighted index return; SMB_t is the return on a portfolio of small firms minus the return on a portfolio of large firms; and HML_t is the return on a portfolio of high book-to-market ratio firms minus the return on a portfolio of low book-to-market ratio firms; RMW_t is the return on a portfolio of robust operating profitability firms minus the return on a portfolio of weak profitability firms; CMA_t is the return on a portfolio of conservative investment firms minus the return on a portfolio of aggressive investment firms. We choose the Fama–French five-factor model to study the long-run stock performance of buyback firms because of its better explanatory power than the three-factor model.

Under the null hypothesis of no abnormal performance, the value of the intercept α in the above regression is expected to be zero. We examine the stock price performance for the low Q-high free cash flow firms and high Q-low free cash flow firms. The

Table 1 Distribution of stock buybacks by calendar year

Year	Number of buybacks	Year	Number of buybacks
1986	6	2002	166
1987	6	2003	113
1988	5	2005	159
1989	8	2006	182
1990	49	2007	247
1991	9	2008	244
1992	31	2009	84
1993	26	2010	132
1994	144	2011	176
1995	134	2012	130
1996	196	2013	137
1997	220	2014	182
1998	342	2015	182
1999	234	2016	120
2000	229	2017	132
2001	189	2018	129
		Total	4460

Number of stock buybacks through Open Market Repurchase from 1986–2018 and included in our sample. From the original data of 14,626 firms taken from the SDC database, the following table shows the number of buybacks of firms that have data available in both CRSP and Compustat and are included in our sample

undervaluation hypothesis predicts that the buyback firms will have abnormal stock price performance following the buyback if the market underestimates the value of buybacks at the time of announcement. The free cash flow hypothesis would predict that the intercept for low Q-high free cash flow firms is positive and significantly different from zero and is higher than the intercept for high Q-low free cash flow firms.

4 Empirical results

In Table 1, we show year-wise the number of buybacks included in our sample from 1986 to 2018. A total of 14,626 firms were involved in stock buybacks during this period, but we had to include only those firms in our sample that had data in CRSP and Compustat. These firms had a total of 4,460 stock buybacks during the sample period.

Table 2 shows the firm characteristics of buyback firms and the buyback stock size. For example, the average market capitalization of buyback firms is $6,991.85 million, and the average size of buybacks is $645.24 million. The average size of the buyback scaled by the market capitalization is 0.114. These firms have free cash flow to book value of assets ratio of 0.056 and the average Tobin's Q is 1.986.

In Table 3, Panel A, we show the cumulative average abnormal returns (CAAR) for the entire sample in four event windows, (-1, + 1), (-5, + 1), (-10, + 2), and (-10, + 10). The CAARs are positive and significant at the 1% level in all the event windows. In these four event windows, the means (medians) are 2.27% (1.46%), 1.41% (1.17%), 0.69% (0.88%),

Table 2 Mean and median statistics for buyback firms

Variable	Mean (median)
Book value ($MM) mean (median)	1898.294 (278.978)
Pretax operating cash flow in ($MM)	538.587 (48.748)
Capitalization ($MM)	6991.85 (612.420)
Repurchase size ($MM)	645.243 (45.122)
Repurchase size to capitalization	0.114 (0.073)
Free Cash Flow to Book Value of Assets	0.056 (0.063)
Tobin's Q	1.986 (1.616)

Mean and Median values of the characteristics of Stock Buybacks by industrial firms during 1986–2018. The sample is taken from the SDC database. Except for buyback size, values are for the year prior to the buyback. Pretax operating cash flow is defined as net sales minus cost of goods sold, minus selling and administrative expenses, but before deducting interest, depreciation, and amortization expenses. Cash flow to book value is pretax operating cash flow divided by the book value of total assets and measures the sample firm's raw performance. Capitalization is the market price of shares times the number of shares outstanding. Repurchase size is the dollar value of the buyback

and 1.25% (1.21%), respectively. Consistent with the signaling hypothesis, the results show that the market reacts positively to stock buyback announcements.

Panel A also shows the difference in CAARs of low Tobin's Q firms and high Tobin's Q firms. Low Tobin's Q firms are those in the fourth quartile in the descending order of ranking of Tobin's Q, and high Tobin's Q firms are those in the first quartile. We examine the CAARs of these two groups of firms to see if firms' growth opportunities affect market reaction to stock buyback announcements. For the $(-1,+1)$ event window, the CAARs of the low and high Tobin's Q firms are 3.59% and 2.02%, respectively, and the difference of 1.57% is significant at the 1% level. For the $(-5,+1)$ event window, the CAARs are 2.62% and 1.30%, and the difference of 1.32% is significant at the 5% level. For the $(-10,+2)$ event window, the CAARs are 1.85% and 0.8%, and the difference of 1.05% is significant at the 10% level. For the $(-10,+10)$ event window, the CAARs are 2.77% and 1.47%, and the difference of 1.30% is significant at the 10% level. The results with the median are very similar to those with the mean. These results show that the market views stock buybacks more positively for low-growth opportunities firms than for high-growth firms. It is better for firms with few growth opportunities to return surplus cash to shareholders through stock buybacks than retain it within the firm or squander it on destructive projects. These results support our first two hypotheses.

In Table 4, Panel B, we study the combined effect of Tobin's Q (capturing the growth opportunities) and the level of free cash flow on the stock price reaction to buyback announcements. We compare the CAARs of Low Tobin's Q-High free cash flow firms (LowQ-HighFCF) and High Tobin's Q-Low free cash flow firms (HighQ-LowFCF).

Table 3 Announcement period returns for stock buyback firms. Panel A: Cumulative average abnormal returns (CAAR) for the total sample, Low Tobin's Q firms, and High Tobin's Q firms

Event window		Full sample	High Q sample (1)	Low Q sample (2)	Difference (2) – (1)
(-1, + 1)	Mean	2.27%***	2.02%***	3.59%***	1.57%***
	Median	1.46%***	1.26%***	2.24%***	0.98%***
	Observations	4460	1115	1115	
(-5, + 1)	Mean	1.41%***	1.30%***	2.62%***	1.32%**
	Median	1.17%***	1.26%***	1.81%***	0.55%**
	Observations	4460	1115	1115	
(-10, + 2)	Mean	0.69%***	0.80%***	1.85%***	1.05%*
	Medium	0.88%***	1.12%***	1.48%***	0.36%
	Observation	4460	1115	1115	
(-10, + 10)	Mean	1.25%***	1.47%***	2.77%***	1.3%*
	Medium	1.21%***	1.60%***	2.23%***	0.63%*
	Observation	4460	1115	1115	

Announcement period returns for buyback firms during the period 1986–2018. Cumulative abnormal returns are reported for days –1 to + 1, –5 to + 1, –10 to + 2, and -10 to + 10, where day 0 is the stock buyback announcement. Cumulative abnormal returns are based on a single-factor market model estimated from day –255 to day –46 for each firm. Significance levels are based on the parametric t-statistic for the mean and the Wilcoxon signed-rank test for the median. Low Tobin's Q firms are those in the bottom quartile (lowest 25% in the ranking according to Tobin's Q), and high Tobin's Q firms are those in the top quartile

*** Statistically significant at the 0.01 level

** Statistically significant at the 0.05 level

* Statistically significant at the 0.1 level

Table 4 Announcement period returns for stock buyback firms. Panel B: Difference in CAARs of Low Growth-High FCF Firms and High Growth-Low FCF Firms

Event window		High Q Low FCF sample (1)	Low Q High FCF sample (2)	Difference (2) – (1)
(-1, + 1)	Mean	1.97%***	3.46%***	1.49%***
	Median	1.36%***	2.06%***	0.70%**
	Observations	557	557	
(-5, + 1)	Mean	0.69%	2.71%***	2.02%***
	Median	0.91%***	1.70%***	0.79%**
	Observations	557	557	
(-10, + 2)	Mean	0.023%	2.46%***	2.43%***
	Medium	0.59%	1.93%***	1.44%***
	Observation	557	557	
(-10, + 10)	Mean	1.08%	3.37%***	2.29%**
	Medium	1.49%**	2.49%***	1.00%**
	Observation	557	557	

In each Tobin's Q quartile, firms are ranked into two groups according to their free cash flow/total assets ratio. Low growth-High free cash flow firms are those in the bottom quartile ranking according to Tobin's Q and the top 50% according to free cash flow/total assets ratio. High growth-Low free cash flow firms are those in the top quartile ranking according to Tobin's Q and the bottom 50% ranking according to free cash flow/total assets ratio

*** Statistically significant at the 0.01 level

** Statistically significant at the 0.05 level

* Statistically significant at the 0.1 level

Table 5 Regression of abnormal announcement period returns on firm characteristics

Dependent variables: Cumulative abnormal return period				
Independent Variables	−1 to + 1	−5 to + 1	−10 to + 2	−10 to + 10
Intercept	0.0541 (9.06)***	0.0293 (3.72)***	0.0032 (0.33)	0.0211 (1.97)**
EBITDA/book value of asset	-0.0387 (-1.84)*	-0.0870 (-2.96)***	-0.0712 (-1.97)**	-0.1007 (-2.5)**
Firm size (Log of book value of assets)	-0.0048 (-7.28)***	-0.0024 (-2.92)***	0.0009 (-0.90)	-0.0020 (-1.75)*
Buyback size/market value of equity	0.0013 (0.09)	0.0322 (1.75)*	0.0677 (2.83)***	0.0533 (1.99)**
Free Cash flow/ book value of Assets	0.0281 (0.23)	0.1011 (3.31)***	0.1413 (3.85)***	0.1469 (3.41)***
LowQ-HighFCF Dummy	0.0099 (2.37)**	0.0096 (1.79)*	0.0158 (2.35)**	0.0157 (2.10)**
Adjusted R^2	0.0168	0.0087	0.0086	0.0086
F	15.23***	8.32***	8.24***	7.23***
N	4460	4460	4460	4460

Estimates of cross-sectional regressions of the announcement period return for stock buyback firms on firm characteristics. The dependent variables are cumulative abnormal returns for days (-1, 1), (–5 to + 1), (-10, + 2), and (–10 to + 10), where day 0 is the announcement of the stock buyback. Cumulative abnormal returns are based on a single-factor market model estimated from day –255 to day –46 for each firm. White (1980) *t*-statistics are in parentheses

*** Statistically significant at the 0.01 level

** Statistically significant at the 0.05 level

* Statistically significant at the 0.1 level

LowQ-HighFCF firms are those in the bottom quartile in the ranking according to Tobin's Q and in the top 50% according to free cash flow/total assets ratio. HighQ-LowFCF firms are those in the top quartile in the ranking according to Tobin's Q and in the bottom 50% according to free cash flow/total assets ratio. For the (-1, + 1) event window, the CAARs are 3.46% and 1.97% for LowQ-HighFCF and HighQ-LowFCF firms, respectively. The difference between the two of 1.49% is significant at the 1% confidence level. For the (-5, + 1) event window, the CAARs are 2.71% and 0.69%, and the difference of 2.02% is significant at the 1% confidence level. For the (-10, + 2) event window, the CAARs are 2.46% and 0.023%, and the difference of 2.43% is significant at the 1% confidence level. For the (-10, + 10) event window, the CAARs are 3.37% and 1.08%, and the difference of 2.29% is significant at the 5% confidence level. From our second hypothesis, we would expect a much stronger positive stock price reaction to stock buyback announcements for LowQ-HighFCF firms than for HighQ-LowFCF firms, and the results support our second hypothesis. Our univariate results support hypotheses 1 and 2. However, these tests do not control for other firm characteristics that can vary across our sample of buyback firms. Hence, in Table 5, we report the results of cross-sectional regressions, where we regress the announcement period returns in different event windows on EBITDA/Assets, Firm Size, Buyback Size, Free cash flow/Assets, and a dummy for high free cash flow-low Q firms.

4.1 Determinants of market reaction to stock buyback announcements

We now examine the results of our multivariate analysis. The multiple regression we have is:

$$\begin{aligned}\text{CAAR} = {} & b_0 + b_1{}^{*}\text{EBITDA/book value of asset} + b_2{}^{*}\text{Firm size} \\ & + b_3{}^{*}\text{Buyback size/market value} + b_4{}^{*}\text{FCF/Assets} \\ & + b_5{}^{*}\text{LowQ} - \text{HighFCF Dummy} + e\end{aligned}$$

CAAR is the dependent variable. EBITDA/total assets is a measure of firm performance. Firm size is measured by the natural log of total assets. The buyback size/market value of equity indicates the relative size of the stock buyback. FCF/Assets is the free cash flow scaled by the book value of assets. LowQ-HighFCF dummy is a dummy variable that takes a value of 1 if a firm is in the bottom quartile in the ranking according to Tobin's Q and also in the top 50% according to free cash flow/total assets. In the methodology section, we discussed why these explanatory variables are included in the above regression. We shall discuss the results of this regression for the (-1, + 1), (-5, + 1), (10, + 2), and (-10, + 10) event windows.

We first examine the regression results for the (-1, + 1) event window. The intercept captures how the market views and reacts to stock buyback announcements. As explained earlier, the intercept shows the market reaction on average to undervaluation signals by the buyback firms. For this event window, we see that the intercept is 0.0541 and significant at the 1% level. This result supports our first hypothesis. The coefficient of EBITDA/book value of assets is negative, -0.0387, and significant at the 10% level. This is consistent with our prediction that the market would prefer firms with higher operating performance to reinvest the earned cash rather than return it to shareholders through stock buybacks. The coefficient of FCF/Assets is positive but not significant. The coefficient of the LowQ-HighFCF dummy is positive, 0.0099, and significant at the 5% level. The firms that would gain the most from stock buybacks have a low Tobin's Q and high free cash flow. Hence, we expect the interaction of low Tobin's Q and high free cash flow to have a positive coefficient. The coefficient of Log (total assets) is negative, -0.0048, and significant at the 1% level, indicating that the announcement period returns are lower for larger firms. The Buyback size/market value of the equity variable is insignificant.

For the (-5, + 1) event window, the intercept is 0.0293 and significant at the 1% level. This result supports our first hypothesis. The coefficient of FCF/Assets is positive, 0.1011, and significant at the 1% level, indicating that the market reacts positively to buyback announcements by firms with high free cash flow. The coefficient of the dummy LowQ-HighFCF is positive, 0.0096, and significant at the 10% level. The firms that would gain the most from stock buybacks have a low Tobin's Q and high free cash flow. The coefficient of Log (total assets) is negative, -0.0024, and significant at the 1% level, indicating that the announcement period returns are lower for larger firms. The coefficient of EBITDA/book value of assets is -0.0870 and significant at 1%, indicating that the market reacts negatively to stock buyback announcements by firms with higher operating performance. The coefficient of Buyback size/market value of equity is positive, 0.0322, and significant at the 10% level, consistent with our prediction that larger buybacks send stronger undervaluation signals and decrease the number of shares outstanding, resulting in an increase in the earnings per share.

The regression results for the (-10, + 2) and (-10, + 10) event windows are similar to those for the (-1, + 1) and (-5, + 1) event windows. For example, for the (-10, + 10) event

Table 6 Long-run stock price performance

Year	Intercept	b	s	h	r	c
Panel A: Low Q-High FCF firms						
+1	0.0121	0.9287	0.7806	0.0357	0.2199	-0.1625
	(3.87)***	(11.98)***	(8.05)***	(0.30)	(1.43)	(-0.77)
+2	0.0083	1.0075	0.9260	-0.0711	0.3047	-0.0618
	(3.60)***	(17.41)***	(11.00)***	(-0.63)	(2.53)**	(-0.34)
+3	0.0092	0.9731	0.8240	-0.0050	0.1845	-0.1546
	(4.53)***	(20.10)***	(11.21)***	(-0.05)	(1.84)*	(-1.00)
Panel B: High Q-Low FCF firms						
+1	0.0047	1.0950	0.7470	-0.1636	-0.4478	0.2293
	(1.56)	(13.56)***	(5.90)***	(-1.05)	(-2.48)**	(0.89)
+2	0.0064	1.0766	0.8053	-0.1510	-0.4268	0.2434
	(2.75)**	(15.71)***	(7.69)***	(-1.05)*	(-2.92)***	(1.15)
+3	0.0042	1.0598	0.8275	-0.1460	-0.3165	0.2752
	(1.80)*	(16.77)***	(8.43)***	(-1.26)	(-2.75)**	(1.40)
+1	0.0047	1.0950	0.7470	-0.1636	-0.4478	0.2293
	(1.56)	(13.56)***	(5.90)***	(-1.05)	(-2.48)**	(0.89)

This table provides long run abnormal stock returns for the samples of Low Q-High FCF firms and High Q-Low FCF firms. The model used to estimate long run abnormal stock returns is the Fama–French 5-factormodel using the approach of Mitchell and Stafford (2000)

$$R_{i,t} - R_{f,t} = \alpha + b\left(R_{M,t} - R_{f,t}\right) + sSMB_t + hHML_{t+}rRMW_t + cCMA_t + \varepsilon_{i,t}$$

where $R_{i,t}$ is the return of firm I, R_{ft} is the one-month Treasury-bill rate; $R_{m,t}$ is the CRSP weighted index return; SMB is the return on a portfolio of small firms minus the return on a portfolio of large firms; and HML is the return on a portfolio of high book-to-market ratio firms minus the return on a portfolio of low book-to-market ratio firms. RMW is the return on a portfolio of robust operating profitability firms minus the return on a portfolio of weak profitability firms. CMA is the return on a portfolio of conservative investment firms minus the return on a portfolio of aggressive investment firms. Heteroskedasticity consistent t-statistics are in parenthesis

*, **, *** statistical significance at 10%, 5%, and 1%, respectively

window, the intercept is 0.0211 and is significant at the 5% level. This result again supports our first hypothesis. The coefficient of FCF/Assets is positive, 0.1469, and significant at 1%. The coefficient of the dummy variable LowQ-HighFCF is positive, 0.0157, and significant at the 5% level. The coefficient of Log (total assets) is negative, -0.0020, and significant at the 10% level. The coefficient of EBITDA/book value of assets is negative, -0.1007, and significant at the 5% level. The coefficient of Buyback size/market value of equity is positive, 0.0533, and significant at the 5% level. Our cross-sectional regressions offer support for the signaling hypothesis and the agency theory hypothesis.

4.2 Long run stock price performance after stock buybacks

We now examine firms' long-run stock price performance for 1, 2, and 3 years after the announcement to buy back their stock. We focus our analysis on firms with low Tobin's Q and high FCF (LowQ-HighFCF) and firms with high Tobin's Q and low FCF (HighQ-LowFCF). Table 6, Panel A has the long-run stock performance results for the Low Q-High FCF firms for the periods 0–12 months, 0–24 months, and 0–36 months following the stock buybacks. Similar results are shown in Panel B for HighQ-LowFCF firms. As explained in the methodology section, we run the Fama–French 5-factor model regressions

and estimate abnormal returns using the calendar-time portfolio approach of Mitchell and Stafford (2000).

In Panel A of Table 6 we see that for LowQ-HighFCF firms, the regression for the 1-year period following stock buybacks has an intercept is 0.0121 and significant at the 1% level. This implies that the LowQ-HighFCF buyback firms earn an average monthly abnormal return of 1.21% in the year after the buybacks. For the 2-year period after the stock buybacks, we see that the intercept is 0.0083 and significant at the 1% level, indicating that over the two years after the buybacks, the LowQ-HighFCF buyback firms earn an average monthly abnormal return of 0.83% per year. For the 3-year period after the buybacks, the intercept is 0.0092 and significant at the 1% level. This implies that the LowQ-HighFCF buyback firms earn an average monthly abnormal return of 0.92% over the three years after the stock buybacks. The results show that the market does not fully absorb the information conveyed in the buyback announcements at the time of announcements by this subgroup of firms. In Panel B of Table 6, we offer the results for the 1-year, 2-year, and 3-year periods after the stock buybacks for the High Q-Low FCF firms. For the 1-year period, the intercept is 0.0047, but is insignificant. For the 2-year period, the intercept is 0.0064 and is significant only at the 5% level. For the 3-year period, the intercept is 0.0042 and is significant only at the 10% level.

To summarize the results in Table 6, LowQ-HighFCF firms show more substantial positive abnormal long-run returns than HighQ-LowFCF firms. The market is underreacting more to the announcements of stock buybacks by low growth high free cash flow firms than to the announcements by high growth low free cash flow firms.

5 Conclusion

In 2022, U.S. firms repurchased more than one trillion worth of their stock. This large amount of stock buybacks has attracted the attention of academicians, practitioners, and the general public.

Our study examines the stock price reaction to buyback announcements by firms and their long-run stock performance following the buyback. We report several results that add to the literature. We use several theories to explain our empirical findings. According to the signaling theory, the market reacts positively to buyback announcements because the buybacks signal that the shares are undervalued. Our empirical findings support this. The agency theory of free cash flow suggests that if firms with low growth opportunities use their surplus free cash flows to buy back their shares, managers have fewer resources to waste on unproductive investments that reduce the firm value, and the benefits of stock buybacks would be even greater. Consistent with the agency theory, the announcement period returns are even higher for firms with low growth opportunities and high free cash flow. Our cross-sectional regressions further reinforce the findings that the announcement period returns are the highest for firms with low growth opportunities and high free cash flows.

We also examine the long run performance of buyback firms following the stock buyback announcements. Low-growth firms with high free cash flow tend to outperform the market for the three years following stock buybacks. These buyback firms have average monthly excess returns of 1.21%, 0.83%, and 0.92% for one, two and three years, respectively.

Our study offers insights to investors and lawmakers. Investors should not consider all stock buybacks to be the same. Stock buybacks by some firms create more value than

others. Investing in a portfolio of low growth-high free cash flow firms will give the most excess returns. These returns can persist for up to three years following the stock buyback.

Our study also offers insights to lawmakers and does not lend support some recent regulations such as the Stock Buyback Tax. Penalizing all stock buybacks with this tax will discourage firms with surplus cash but low growth opportunities from returning the cash to their shareholders through stock buybacks. This will only increase the opportunities of managers to invest in value-reducing projects.

References

Alderson MJ, Halford JT, Sibilkov V (2020) An examination of the wealth effects of share repurchases on bondholders. J Corp Finan 65:101499

Allen F, Michaely R (2003) Payout policy. In: Constantinides GM, Harris M, Stulz R (eds) Handbook of the economics of finance. Elsevier, North-Holland, Amsterdam, pp 337–429

Asness C, Hazelkorn T, Richardson S (2018) Buyback derangement syndrome. J Portf Manag 44:50–57

Blouin J, Krull L (2009) Bringing it home: a study of the incentives surrounding the repatriation of foreign earnings under the American Jobs Creation Act of 2004. J Account Res 47:1027–1059

Bonaimé A, Kahle K (2024) Chapter 4: Share repurchases. Handbook of Corporate Finance. Elgaronline, pp 176–222. https://doi.org/10.4337/9781800373891.00011

Brav A, Graham JR, Harvey CR, Michaely R (2005) Payout policy in the 21st century. J Financ Econ 77(3):483–527

Campbell K, Ellingson DA, Weiss JM (2024) Stock buybacks in the spotlight. CASE J. https://doi.org/10.1108/TCJ-07-2023-0171

Comment R, Jarrell GA (1991) The relative signaling power of Dutch-auction and fixed-price self-tender offers and open-market share repurchases. J Financ 46(4):1243–1271

Damodaran (2019) Interview with Nathan A and Grossman D, Goldman Sachs Global Macro Research, Issue 77. https://www.goldmansachs.com/intelligence/pages/top-of-mind/buyback-realities/report.pdf

Daniel K, Hirshleifer D, Subrahmanyam A (2002) Investor psychology and security market under- and overreactions. J Financ 53(6):1839–1885

Davis S (2019) Interview with Nathan A and Grossman D, Goldman Sachs Global Macro Research, Issue 77. https://www.goldmansachs.com/intelligence/pages/top-of-mind/buyback-realities/report.pdf

Dann LY (1981) Common stock repurchases: an analysis of returns to bondholders and stockholders. J Financ Econ 9(2):113–138

DeAngelo H (2023) The attack on share buybacks. Eur Financ Manag 29:389–398

Dharmapala D, Foley CF, Forbes KJ (2011) Watch what I do, not what I say: the unintended consequences of the Homeland Investment Act. J Finance 66:753–787

Dittmar AK (2000) Why do firms repurchase stock? J Bus 73(3):331–355

Eberhart A, Siddique AR (2004) Why are stock buyback announcements good news? In AFA 2005 Philadelphia Meetings Paper. https://doi.org/10.2139/ssrn.647843

Edmans A (2017) The case for stock buybacks. Harvard Bus Rev. https://hbr.org/2017/09/the-case-for-stock buybacks

Fama EF (1998) Market efficiency, long-term returns, and behavioral finance. J Financ Econ 49(3):283–306

Farre-Mensa J, Michaely R, Schmalz MC (2014) Payout policy. Annu Rev Financ Econ 6:75–134

Fried J, Wang C (2018) Are buybacks really shortchanging investment? Harv Bus Rev 92:46–55

Fu F, Huang S (2016) The persistence of long-run abnormal returns following stock repurchases and offerings. Manage Sci 62:964–984

Guay W, Harford J (2000) The cash flow permanence and information content of dividend increases versus repurchases. J Financ Econ 57:385–415

Ikenberry D, Lakonishok J, Vermaelen T (1995) Market underreaction to open market share repurchases. J Financ Econ 39(2):181–208

Jagannathan M, Stephens CP, Weisbach MS (2000) Financial flexibility and the choice between dividends and stock repurchases. J Financ Econ 57:355–384

Jakob S, Valta P (2023) What do market participants learn from share repurchases? Evidence from a return decomposition. J Corp Finan 82:102451

Jensen MC (1986) Agency cost of free cash flow, corporate finance, and takeovers. Am Econ Rev 76(2):323–329
Jia H, Zhu Y, Chen X (2024) Stock repurchase and stock price crash risk. Financ Res Lett 60:104879
John K, Knyazeva A, Knyazeva D (2011) Does geography matter? Firm location and corporate payout policy. J Financ Econ 101:533–551
John K, Williams J (1985) Dividends, dilution, and taxes: a signaling equilibrium. J Finance 40(4):1053–1070
Jun S, Jung M, Walking RA (2009) Share repurchase, executive options and wealth changes to stockholders and bondholders. J Corp Finan 15:212–229
Jung K, Kim YC, Stulz RM (1996) Timing, investment opportunities, managerial discretion, and the security issue decision. J Financ Econ 42(2):159–185
Kahle KM, Stulz RM (2021) Why are corporate payouts so high in the 2000s? J Financ Econ 142(3):1359–1380
Lang LHP, Stulz RM, Walking RA (1991) A test of the free cash flow hypothesis: The case of bidder returns. J Financ Econ 29(2):315–335
Lazonick W (2014) Profits without prosperity. Harv Bus Rev 92(9):46–55
Lee B, Suh J (2011) Cash holdings and share repurchases: international evidence. J Corp Finan 17:1306–1329
Lee I, Park Y, Pearson ND (2020) Repurchases after being well known as good news. J Corp Finan 62:101552
Lie E (2002) Do firms undertake self-tender offers to optimize capital structure? J Bus 75(4):609–639
Liu H, Swanson EP (2016) Is price support for overvalued equity a motive for increasing share repurchases? J Coral Financ 38:77–91
Manconi A, Peyer U, Vermaelen T (2019) Are buybacks good for long-term shareholder value? Evidence from buybacks around the world. J Financ Quant Anal 54:1899–1935
Maxwell WF, Stephens CP (2003) The wealth effects of repurchases on bondholders. J Financ 58(2):895–920
Michaely R, Thaler RH, Womack KL (1995) Price reactions to dividend initiations and omissions: overreaction and drift? J Finance 50:573–608
Mitchell ML, Stafford E (2000) Managerial decisions and long-term stock price performance*. J Bus 73(3):287–329
Obernberger S (2014) The timing of actual share repurchases. Working paper. https://doi.org/10.2139/ssrn.2434214
Peyer U, Vermaelen T (2009) The nature and persistence of buyback anomalies. Rev Financ Stud 22:1693–1745
Saxena V, Sahoo S (2023) Corporate cash holdings and share buyback: evidence from emerging markets. J Emerg Mark Finance 22(4):437–463
Vermaelen T (1981) Common stock repurchases and market signaling: an empirical study. J Financ Econ 9(2):139–183
Wang JY, Chang CH, Wang JL (2023) Do prior financial events to share repurchase announcements matter? J Emerg Mark Finance 23(1). https://doi.org/10.1177/09726527231202065
White H (1980) A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. Econometrica 48(4):817–838