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Stock repurchases and future operating performance: empirical evidence from Italy

Abstract

In this work we analyze the operating performance of industrial companies listed on the Italian Stock Exchange that announced a share buyback from 1989 to 2001. In detail we aim at verifying if the buyback announcement releases optimistic information about future profitability ('Signalling Hypothesis') or conveys a commitment that companies will pay back cash to investors in case of poor operating performance, in order to avoid agency costs ('Free Cash Flow Hypothesis').

We find that the sample companies exhibit a significant worsening of the operating performance subsequent to the announcement, both in absolute terms and benchmarking with a control sample of matching companies. The poor operating performance is particularly significant for companies that effectively buy back the shares after the announcement, while no significant difference is detected for firms that announce the buyback but do not repurchase shares effectively. The results validate the 'Free Cash Flow Hypothesis'.

Keywords: stock repurchases, open market, operating performance, Italian market, propensity score matching.
JEL Classification: G30.

Introduction

Buybacks take place when a company repurchases a portion of its own equity issued.

The rising diffusion of these operations is attracting an increasing interest in the financial literature.

The empirical evidence generally highlights a positive abnormal return of the company stock price at the announcement of a share repurchase. The commonly accepted interpretation is that managers announcing a buyback are signalling the acknowledgement of future good operating performances.

This study aims at verifying if companies buying back their own shares do really experience differential earning levels, both in absolute and relative terms, in a temporal window of six years around the announcement date.

We analyze a sample of 160 companies listed on the Italian Stock Exchange that announced a buyback from 1989 to 2001. We distinguish among 99 companies that effectively bought back their stock after the announcement, and 61 companies that, on the contrary, did not follow up to the announcement.

We build an appropriate control sample adopting both traditional matching methods and the "propensity score matching algorithm", that recently is finding application in the economic and financial fields[1].

Our empirical results seem to support the Free Cash Flow Hypothesis, i.e. companies that announce a buyback are characterized by poor operating performance in the medium-long run both in

absolute terms, and with respect to matching firms. This effect is heavily significant for companies that effectively buy back shares, and is less significant for companies that announce stock repurchases but actually do not exercise such option.

The remainder of this paper is organized as follows. In Section 1 we focus on the existing literature about stock repurchases. Section 2 describes the research hypotheses and the methodologies adopted in the analysis. In Section 3 we describe the results of the analysis. The last summarizes and gives an interpretation of the results obtained.

1. Literature review

The existing studies about buyback announcements are generally focused on the stock price reaction, and detect positive abnormal returns at the announcement date. In the USA the average abnormal return is +3.53%, during 48 months after the announcement (Vermaelen and Peyer, 2005). On the Italian market Arosio, Bigelli and Paleari (2000) find an average price reaction equal to +0.96%. Yet considering a sub-sample of cases in which the announcement is directly released by the board of directors and not influenced by the contemporary announcement of other information about dividends and/or earnings, the average abnormal return is +2.80%.

In order to interpret the empirical evidence of price reactions surrounding the buyback announcement, the financial literature has advanced many theories, the Signalling Hypothesis and the Free Cash Flow Hypothesis being the most credited. The Leverage Hypothesis, the Dividend Tax Avoidance Hypothesis, the Bondholder Expropriation Hypothesis, the Price Pressure Hypothesis, and the Option Hypothesis, are considered as well.

[1] See Villalonga (2004), Hillion and Vermaelen (2002), Cheng (2003), Li and Zhao (2005).

The Signalling Hypothesis (Bhattacharya, 1979; Vermaelen, 1981; Dann, 1981; Miller and Rock, 1985; Comment and Jarrell, 1991) posits that buyback announcements represent signals that the management drops to the market in order to reveal optimistic expectations about future operating performances. In fact, if shares were overvalued by the market, the managers would not be stimulated to carry out a buyback repurchasing securities that in the long run would provide poor returns.

On the contrary, the Free Cash Flow Hypothesis (Easterbrook, 1984; Jensen, 1986) posits that the market reaction around the announcement can be associated with the reduction of the free cash flow. Conflicts of interests between shareholders and managers turn out extremely important when enterprises generate excess liquidity. Managers pursuing their own interests could be boosted to increase the enterprise size beyond the optimal level. This misalignment of objectives creates agency costs (Jensen and Meckling, 1976). Agency costs are more likely to appear, the larger is the free cash flow generated by the enterprise. If the firm generates excess cash flows, the incentive to invest in inefficient projects will become irresistible for managers.

The Leverage Hypothesis (Jensen, 1986; DeAngelo and Masulis, 1980) finds that a buyback increases the firm's leverage through a reduction in assets and may create value for the enterprise since it reduces the possibility of inefficient investments.

According to the Dividend Tax Avoidance Hypothesis (Vermaelen, 1981), investors prefer to receive liquidity through stock repurchases if taxation is favorable compared to dividends payout. The consequent effect is a positive market reaction at the announcement.

The Bondholder Expropriation Hypothesis (Galai and Masulis, 1976) asserts that a buyback announcement has a positive impact on the stock price, because it involves a wealth transfer from debtholders to shareholders of the firms, correlated with a decrease in the assets value deriving from share repurchases. However, Vermaelen (1981) observes that such hypothesis collapses if creditor protection rules are at work, limiting the distribution of cash through dividends.

The Price Pressure Hypothesis (Vermaelen, 1984) asserts that share prices are affected by a temporary demand increase as a consequence of the buyback activity and announcement. Once that the demand pressure is over, prices move to their pre-announcement level. However, this hypothesis appears realistic in the case of repurchases carried out through tender offerings: in this case shares are bought in a relatively short period of time at a significant price premium. On the contrary, the hypothesis appears less convincing in the case of open market repurchases that do not modify the market demand in significant terms.

Finally, the Option Hypothesis (Ikenberry and Vermaelen, 1996) posits that the buyback announcement is an option that can be exercised whenever market conditions are favorable. The positive reaction of the share prices to the announcement is related to the option value, recognized by the market.

Interestingly enough, the empirical evidence about firms' operating performance subsequent to stock repurchases often highlights results incoherent with the positive abnormal returns at the announcement.

Bartov (1991) analyzes a sample of 185 U.S. companies announcing open market stock repurchases from 1978 to 1986 and finds an average increase in the level of earnings, statistically significant during the announcement year. The author shows that analysts update their forecasts about the operating performances of the announcing enterprises and concludes in favor of the hypothesis that buybacks convey positive information about firm's operating performance in the future.

Guay and Harford (2000) examine the variations in cash flows reported by 1,153 companies announcing a buyback from 1981 to 1993 on the U.S. market. Comparing the companies with an appropriate control sample, the authors claim that cash flow increases only in the short run and no improvements are detected in the long run.

Grullon and Michaely (2004) analyze the operating performances of 4,443 U.S. firms that announced a buyback from 1980 to 1997 relatively to a benchmark control sample. In the three years after the announcement, they find a significant reduction in the operating performance compared to the pre-announcement period and superior operating performance compared to the control sample, although statistically not significant. Therefore the authors support the Free Cash Flow Hypothesis.

Lie (2005) studies the operating performances of 4,729 firms listed on the U.S. stock market that announced a buyback from 1981 to 2000. The author considers quarterly accounting data, in order to estimate changes in the operating performances and separately examines a sub-sample of firms that effectively repurchased shares (while other companies just announced the intention). His findings contrast with Grullon and Michaely (2004). In fact, the full sample exhibits a decline in the operating performances, but the companies that

effectively repurchased their own shares perform significantly better than the control sample. For the sub-sample of firms that did not effectively buy the share, there is no statistically significant difference in the operating performances compared to the respective control sample does. Therefore the author concludes that a buyback carries positive information to the market about future earnings, supporting the Signalling Hypothesis.

2. Research hypothesis and methodology

The objective of the analysis is to study the operating performance of industrial firms that announced and effectively engaged in a buyback on the Italian Stock Exchange. The Italian regulations allow listed companies to repurchase shares both on the open market and through a tender offer. However the latter alternative is rarely implemented.

We collect the announcements of stock repurchases issued by companies listed on the Italian Stock Exchange from 1989 to 2001 and published in financial newspapers.

In order to determine the effective repurchases subsequent to the announcement, we track the amount of treasury shares and the variations in the equity book value of the companies up to 18 months following the announcement. Data about assets, liabilities and operating performance are taken from official annual reports.

The analysis concerns three different groups: the sample made up by 160 first announcements [Sample 1]; the sub-sample, derived from the previous one, with 99 enterprises that engage in effective buyback activity[1] subsequent to the announcement [Sample 2]; the sub-sample, made up by 67 enterprises that just announced a repurchase with no effective follow-up [Sample 3].

Following Barber and Lyon (1996) and Lie (2005), we measure the firms' operating performance computing, for each year t, the ratio between EBITDA (Earnings before tax depreciation and amortization) resulting from the official annual report at the end of period t and the "cash adjusted" assets, namely the book value of total assets net of cash and marketable securities at the end of period t.

To test the robustness of our results, we even adopted alternative indicators such as Earnings Before Interest and Taxes, and Net Profit instead of EBITDA. Such measures of profitability have been compared to Sales and to Book Value of Assets. Performances are considered in absolute terms as well as in relative terms with respect to a reference sample.

Barber and Lyon (1996) recommend to consider changes in annual values to examine unexpected or abnormal performance, because the test statistics based on changes are more powerful than those based on reported levels. We then adopt both absolute levels and annual changes in the operating performance.

Fama and French (2000) show that future profitability is partially explainable on the basis of firms and market characteristics. Therefore in the second part of the analysis we control for the variables above according to two different methodologies.

First, we follow an ordinary matching procedure.

Adopting the terminology introduced in the causal inference theory (Rubin, 1977), we can consider a firm's decision to buy back shares as a "treatment", and any following abnormal operating performance as the "treatment effect".

Let OP_{i1} be the operating performance of firm i, during a reference period, if the firm announces a buyback, and OP_{i0} – the operating performance if, on the contrary, the firm does not announce a buyback. The 'treatment effect' for firm i, i.e. the impact of a buyback announcement on its operating performance, is defined as OP_{i1} - OP_{i0}.

The essential problem in determining the impact of a buyback announcement is that we are not able to observe the operating performance of companies that announce a share repurchase *in the case that they had not announced it.* Instead, we rely on a group of control firms, i.e. companies that have never announced a buyback. Generally speaking, the result is a biased estimation of the 'treatment effect'.

Rubin (1977) demonstrates that the 'treatment effect' can still be estimated by introducing a function of observable variables. A firm announcing a buyback and its counterpart not announcing a buyback share some observable characteristics, which can be adopted as matching criteria.

According to this methodology, we generate a control sample based on these observable characteristics: business sector (in order to control for economic cycles), operating performances before the buyback and market-to-book ratio (Dittmar, 2000; Jagannathan, Stephens and Weisbach, 2000).

The matching sample has been built considering all the companies listed on the Italian Stock Exchange from 1989 to 2001, that did not announce any stock repurchase plan. Following Lie (2001), we identify matching firms with the following characteristics on a one-to-one basis: the same three-digit SIC code; a level of operating performance, measured as

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[1] Notice that the merging of Sample_2 and Sample_3 does not coincide with Sample_1, because Sample_2 contains some firms that begun to repurchase their shares not at the first announcement, but subsequent to a renewal.

EBITDA/Cash Adjusted Assets, comprised between 80% and 120% of what reported by the sample firm at year -1; and a market-to-book ratio of Assets computed as in Grullon and Michaely (2004) comprised between 80% and 120% of what reported by the sample firm at year -1.

For each sample firm we identify the matching counterpart that at the year before the announcement minimizes the difference in the performance[1].

Again we test the robustness of the results, rejecting outliers from the sample and adopting alternative indicators (e.g., the EBITDA/Sales ratio).

The second alternative matching procedure that we adopt is the "propensity score matching" (PSM). It is becoming increasingly popular to construct suitable control groups. Lately used by the financial literature, it is an innovative method to evaluate possible anomalies in corporate finance (Villalonga, 2004; Hillion and Vermaelen, 2002). It offers three major advantages. First, no constraints need to be imposed on the matching variables. Second, a larger number of matching variables may be exploited. Third, the methodology is effective even when very few benchmark units exist. Different versions of the propensity score matching algorithm have been suggested by the literature. A simple version, known as the "nearest-match" method, works as follows. Given a set of observable characteristics, a logistic function is estimated using a sample that contains both the analysis and control units. The analysis units are ranked according to the estimated conditional probability, namely the propensity score. Each unit is then matched to a single control unit characterized by the closest propensity score. The score synthesizes the multi-dimensionality of the matching problem, maximizing the comparability between the two sample groups.

The econometric theory behind the propensity score matching is the 'Propensity Score Theorem' developed by Rosenbaum and Rubin (1983) in order to compare a 'treatment group' with a 'non-treatment' control group. Let $P(X)$ be 'propensity score', namely the probability of a company being assigned to the 'treatment' group, with X being a vector of independent observable variables. The authors demonstrate that matching can be carried out by computing the probability $P(X)$, instead of the independent variables X, thus reducing the

dimensionality of the matching problem. According to the Propensity Score Theorem, finding the matching company for a firm that announces a buyback, given a set of observable characteristics X, is equivalent to finding the matching counterpart looking at the probability $P(X)$ of a buyback announcement conditional on the vector of firm characteristics.

Following the algorithm proposed by Dehejia and Wahba (1998), the steps of the 'propensity score matching' methodology are as follows:

Step 1: Choose the control variables X to maximize the classification rate by the hit-or-miss criterion. Let $p(i,t)$ be the probability that firm i will announce a buyback during year t, let $X(i,t)$ be a vector of observable characteristics of the firm that either may affect the announcement of a stock repurchase or the operating performance, and let β be a vector of unknown parameters to be estimated. Then, the logit model specifies that:

$$p(i,t) = \frac{1}{1 + e^{-\beta \cdot X(i,t)}} . \qquad (1)$$

Step 2: Estimate β and compute the predicted probability of the buyback announcement (i.e., the 'propensity score') for both the sample companies ('treatment group') and their counterparts ('non-treatment group').

Step 3: For any firm that announces a buyback, select the counterpart that in the same year minimizes the difference in the propensity score. This is the so-called "nearest-neighbor-match".

Our goal is to estimate the probability of a buyback announcement. The exogenous variables that we consider in order to estimate the logistic function are as follows.

We consider operating performance indicators (EBITDA/Cash Adjusted Assets; EBITDA/Sales; Earnings/Sales). Some studies show that pre-event operating performances have a predictive power about follow-on profitability (Fama and French, 2000; Barber and Lyon, 1996; Lie, 2001; Lie, 2005). Then, we consider M/B ratio (Fama and French, 2000; Lie, 2001). The literature points out that lower ratios are positively correlated to the probability of a buyback (Dittmar, 2000; Jagannathan, Stephens and Weisbach, 2000).

We posit that buyback choices depend on the interaction between operating performances and market valuation, therefore we introduce in the analysis the product between the M/B ratio and EBITDA/Cash Adjusted Assets (EBITDA/Sales and Earnings/Sales are considered as well).

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[1] If we do not find any firm that meets the criteria above, we iterate the process first for matching firms with the same two-digit SIC code as the sample firms, the same one-digit SIC code and then for all firms independently of their SIC code. We exclude from the sample newly listed companies, since the M/B ratios are not available in the previous year and the companies not closing the annuals accounts as of December 31.

We include in the regression the firm size, measured by the log of the asset value. This variable influences the buyback choice since it represents a proxy of information asymmetry. Vermaelen (1981) and Comment and Jarrel (1991) observe that large enterprises are more able to attract market attention and therefore are less subject to information asymmetry, thus reducing the probability of being undervalued. On the contrary, Jensen (1986) posits that large firms generate larger free cash flows and therefore they should be associated with increasing agency costs.

Moreover, we consider the debt/assets ratio as well as the cash/assets ratio (a proxy of the liquidity in excess and, therefore, of its free cash flow). We include the distribution of dividends (measured by the dividend per share), because it persecutes the same objective as the buyback (paying cash to shareholders). Therefore larger dividends may be associated with lower probability of stock repurchases.

At last, we include dummy variables referring to the announcement year.

We estimate the propensity score through a binomial logistic regression on the entire sample and on the matching companies. For each sample company we identify the benchmark enterprise that belongs to the control sample and that minimizes the gap between the two propensity scores considered.

3. Empirical results

The methodologies described in the previous section have been applied to industrial enterprises listed on the Italian Stock Exchange that announced a share buyback between 1989 and 2001.

Table 1 describes the dataset. The initial sample has been divided into three groups: companies that have carried out the announcement [160]; those that effectively engaged in a buyback [99]; and at last, those that announced the buyback but did not proceed to purchase [67]. Remarkably, we record an increasing number of announcements, starting from 1993 up to a maximum in 2001 [18].

Table 2 lists the average and median operating performances referring to the three samples in terms of EBITDA to Cash Adjusted Assets ratio. In particular, we underline at time t0 (namely the year of the announcement) an average positive performance ratio that is equal to 15.97% for the whole sample. It is equal to 15.42% for the sample that effectively engaged in a buyback and it matches 16.34% for the sample that did not engage in a buyback after the announcement. The statistics excluding outlier values are not significantly different. Interestingly, all the

three samples exhibit a negative trend of profitability around the announcement.

Table 1. The sample companies, by announcement year: industrial firms listed on the Italian Stock Exchange from 1989 to 2001 that announced a buyback

Year	Sample 1 All Announcements	Sample 2 Announcements with buyback	Sample 3 Announcements with no effective buyback
1989	9	4	5
1990	15	12[b]	5
1991	9	5[a]	5
1992	6	3	3
1993	2	1	1
1994	6	4	2
1995	6	3	3
1996	10	4	6
1997	15	7	8
1998	20	10	10
1999	14	11[a]	4
2000	25	17[a]	9
2001	23	18[a]	6
Total	160	99	67

Notes: [a] The sample contains one renewal of a buyback already occurred. [b] The sample contains two renewals of buybacks already occurred. The sample is divided into three parts: Sample 1 refers to all announcements; Sample 2 refers to announcements followed by an effective buyback and Sample 3 refers to announcements with no effective buyback detected.

Table 3 describes the annual variation in the performance index and confirms the significant decline after the announcement. In detail, we observe that the whole sample records, on the average, a statistically significant drop [-3.09%] during the year after the announcement and a further statistically significant decline [-1.25%] in the subsequent year. Data without outliers as well as median values confirm the findings.

The sample comprising firms that have effectively repurchased their shares is characterized by a steady statistically significant decline [-3.70%] after the announcement as well as in the following 12 months with a further decrease [-1.37%].

Remarkably, the sample of companies that just announced the buyback with no actual repurchases is not characterized by any significant difference in the operating performance although the Wilcoxon test on the median value highlights a significant decrease in (t_0, t_1) and in (t_2, t_3).

Table 2. Companies' operating performance around a buyback announcement

Period	All announcements			Announcements with buyback			Announcements with no effective buyback		
	Obs	Mean	Median	Obs	Mean	Median	Obs	Mean	Median
t_{-2}	154	14.08%	14.15%	96	13.65%	14.23%	64	15.14%	14.00%
t_{-1}	160	15.72%	14.91%	99	14.92%	15.78%	67	16.77%	13.78%
t_0	160	15.97%	14.39%	99	15.42%	14.15%	67	16.34%	14.10%
t_1	160	12.88%	13.12%	99	11.72%	12.84%	67	14.36%	13.57%
t_2	155	12.18%	12.84%	95	11.18%	12.54%	66	13.56%	14.01%
t_3	148	12.75%	11.39%	92	12.77%	11.68%	61	12.61%	11.25%

Notes: The performance indicator is EBITDA/Cash Adjusted Adjusted ratio. t_0 is the year of the buyback announcement. Sample: 160 companies announcing a buyback, of which 99 companies effectively repurchase shares in the following, and 67 ones not engaging in a buyback.

Table 3. Companies' operating performance growth rate around a buyback announcement

	All announcements			Announcements with buyback			Announcements with no effective buyback		
Period	Obs	Mean	Median	Obs	Mean	Median	Obs	Mean	Median
$\Delta(t_{-2}, t_{-1})$	154	1.28%*	0.49%	96	0.95%	0.17%	64	1.24%	0.72%
$\Delta(t_{-1}, t_0)$	160	0.25%	-0.45%	99	0.50%	-0.71%*	67	-0.43%	-0.12%
$\Delta(t_0, t_1)$	160	-3.09%***	-1.40%***	99	-3.70%***	-1.70%***	67	-1.98%	-0.70%**
$\Delta(t_1, t_2)$	155	-1.25%**	-0.58%*	95	-1.37%**	-0.49%*	66	-0.84%	-0.25%
$\Delta(t_2, t_3)$	148	0.13%	-0.72%**	92	1.29%	-0.37%	61	-1.54%	-1.08%**

Notes: ***, **, * – significant at the 1%, 5% and 10% level respectively. The performance indicator is EBITDA/Cash Adjusted Adjusted ratio. t_0 is the year of the buyback announcement. Sample: 160 companies announcing a buyback, of which 99 companies effectively repurchase shares in the following, and 67 ones not engaging in a buyback.

The evidence suggests that in Italy the announcement of a buyback is associated to future poor operating performance, especially for companies that effectively repurchase shares. The latter are responsible for most of the decline in assets profitability. In order to test the robustness of the results we used other alternative indicators of firms' operating performance. As shown in Table 4 the drop in the operating margin after the announcement is confirmed by other indicators (EBITDA/Book Value of Assets; EBITDA/Sales; EBIT/ Book Value of Assets and Earnings/Sales) and, again, significant especially for the companies that effectively pay cash to shareholders.

Table 4. Mean operating performance around a buyback announcement

Index	All announcements				Announcements with buyback				Announcements with no effective buyback			
	Obs	t0	t1	$\Delta(t0. t1)$	Obs	t0	t1	$\Delta(t0. t1)$	Obs	t0	t1	$\Delta(t0.t1)$
EBITDAt [BV(Assets)t-1+BV(Assets)t]/2	160	13.09%	10.81%	-2.28%***	99	12.61%	9.96%	-2.65%***	67	13.50%	11.92%	-1.57%
EBITDAt [Salest-1+Salest]/2	160	24.32%	20.39%	-3.93%***	99	22.84%	18.66%	-4.19%***	67	25.63%	22.50%	-3.14%
EBITt [BV(Assets)t-1+BV(Assets)t]/2	160	8.59%	6.17%	-2.42%***	99	8.31%	5.63%	-2.67%***	67	8.78%	6.89%	-1.89%
Earningst [Salest-1+Salest]/2	160	6.32%	2.78%	-3.55%***	99	5.95%	2.67%	-3.28%***	67	6.52%	3.12%	-3.40%

Notes: ***, **, * – significant at the 1%, 5% and 10% level respectively. Mean operating performance of the sample companies following a buyback announcement. t_0 is the announcement year. The mean increase in the operating performance after the announcement is also reported. $EBITDA_t$ is Earnings before tax depreciation and amortization registered during year t $BV(Assets)_t$ is Book Value of assets as at the end of year t $Sales_t$ are the overall Sales registered during year t $EBIT_t$ is Earnings before tax registered during year t $Earnings_t$ are Earnings net of taxes registered during year t.

Table 5 and Table 6 report the results of the analysis carried out comparing the three samples, with the control sample composed by matching firms according to business sector, pre-announcement performances and book-to-market value of the assets.

For the sample as a whole, on average, the operating performance reported in Table 5, after the announcement year, is poorer [-1.50%] than the control sample. The median value provides analogous results at t_1 [-0.84%]. Both the numbers are statistically different from zero at the 10% level.

Concerning with the annual performance growth rate, Table 6 reports a remarkable difference in the rate: the buyback sample is characterized by a progress of performance which is significantly lower than the control sample. The mean (median) differential rate is

-1.89% (-1.30%). Thus, the companies that announce a buyback do underperform the control sample in the following months in twice a manner. First, they exhibit poorer operating performance. Second, they exhibit inferior growth rate.

In detail, companies effectively buying back their shares, on the average, underperform the benchmark by -2.23% one year after the announcement. The mean difference is -3.89% during the second year. Median values of differences are -1.35% and -2.22% respectively. All the statistics are significantly different from zero at the 99% level. Referring to the performance growth rate, the difference with the control sample is significant again in the 12 months after the announcement (mean value -2.83%, median -2.13%).

Table 5. Companies' operating performance with a traditional matching

Period	All announcements			Announcements with buyback			Announcements with no effective buyback		
	Obs	Mean	Median	Obs	Mean	Median	Obs	Mean	Median
t_{-2}	129	-1.80%	-0.09%	78	-2.30%	-0.08%	51	-1.03%	-0.27%
t_{-1}	134	0.32%	0.30%*	81	0.10%	0.40%**	53	0.66%	-0.07%
t_0	134	0.39%	0.05%	81	0.60%	0.32%	53	0.05%	-0.28%
t_1	134	-1.50%*	-0.84%*	81	-2.23%**	-1.35%**	53	-0.39%	-0.54%
t_2	130	-1.73%*	-1.52%**	77	-3.89%***	-2.22%***	53	1.40%	-0.32%
t_3	127	-1.04%	-0.45%	75	-1.71%	-1.08%	52	-0.07%	-0.05%

Notes: ***, **, * – significant at the 1%, 5% and 10% level respectively. Differences in the operating performance between companies announcing a stock repurchase and companies belonging to the control sample, built with a traditional matching methodology based on similar characteristics in terms of business sector and B/M ratio. The performance indicator is EBITDA/Cash Adjusted Assets ratio. t_0 is the year of the buyback announcement.

Table 6. Companies' operating performance growth rate with traditional matching

Period	All announcements			Announcements with buyback			Announcements with no effective buyback		
	Obs	Mean	Median	Obs	Mean	Median	Obs	Mean	Median
$\Delta(t_{-2}, t_{-1})$	129	2.05%**	-0.03%	78	2.40%*	-0.05%	51	1.53%	-0.02%
$\Delta(t_{-1}, t_0)$	134	0.06%	-0.02%	81	0.50%	-0.12%	53	-0.61%	0.38%
$\Delta(t_0, t_1)$	134	-1.89%**	-1.30%***	81	-2.83%***	-2.13%***	53	-0.44%	-0.25%
$\Delta(t_1, t_2)$	130	-0.22%	-0.17%	77	-1.60%	-1.38%	53	1.79%	0.47%
$\Delta(t_2, t_3)$	127	0.20%	0.31%	75	1.45%	2.62%	52	-1.59%	-1.70%*

Notes: ***, **, * – significant at the 1%, 5% and 10% level respectively. Differences in the operating performance growth rate between companies announcing a stock repurchase and companies belonging to the control sample, built with a traditional matching methodology based on similar characteristics in terms of business sector and B/M ratio. The performance indicator is EBITDA/Cash Adjusted Assets ratio. t_0 is the year of the buyback announcement.

The analysis of companies announcing a buyback with no actual repurchase does not highlight any significant peculiarity in the operating performance, compared to the benchmark sample[1].

Finally we applied the Propensity Score Matching algorithm, that allows to consider a larger number of variables in order to maximize the degree of similarities between the sample and the comparable firms.

Table 7 lists the variables considered in the logistic regression, their estimated coefficients referring to time t_{-1} (namely the year before the announcement) and their significance level.

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[1] We conducted a robustness check of results excluding outliers, as well as adopting alternative performance indicators. The results remain unchanged.

The results show that dummy variables related to the announcement year are not significantly different from zero. This suggests that the choice to announce a buyback is not determined by any temporal effect or market momentum.

Performance indicators and the M/B ratio do not provide any explanatory power as single variables; on the contrary, the product of these variables is a significant explanatory variable, denoting that a buyback announcement is correlated with the interaction between firms' operating performance and market evaluation.

The company size is positively correlated with the probability of the announcement of a stock repurchase. This result appears coherent with the Free Cash Flow Hypothesis, according to which larger firms are more likely to generate larger free cash flow and thus larger agency costs if they do not pay back money to investors.

The debts/assets ratio seems to be significantly and negatively correlated with the probability of a buyback announcement. This appears coherent with the hypothesis that levered firms are less likely to repurchase shares, since it causes a further increase of the leverage.

The cash/assets ratio is positively and significantly correlated with the probability of an announcement of a share repurchase. Such empirical evidence appears coherent with the Free Cash Flow Hypothesis: a buyback reduces cash in excess.

The dividend per share is positively correlated with the probability of a buyback announcement. This result is at odds with the Substitution Hypothesis (Grullon and Michaely, 2002), according to which buybacks are considered as an alternative mean to pay cash to shareholders.

A possible explanation is as follows. Firms with large amount of cash realized through profits are more willing to buy back shares rather than increasing dividends because they want to avoid a dividend reduction in the future in case of volatile profits. To this extent stock repurchases are a flexible option held by companies that want to follow a policy of "smooth" increase of dividends and at the same time to avoid agency costs.

Following Hillion and Vermaelen (2002) we estimate again the model, removing variables not significantly different to zero. The results are shown in the second column of Table 7.

Starting from the estimated equation we compute the propensity score for each sample company and then we select comparable firms that minimize the differential propensity score.

Table 7. Logistic regression

Variable	β_1	z-test	β_2	z-test
Costant	-6.588***	-6.220	-6.771***	-7.130
M/B	0.013	0.120		
Ebitda/Cash Adjusted Assets	0.326	0.350		
Earnings/Sales	0.043	0.260		
Log(Assets)	0.806***	4.590	0.866***	5.040
Debt/Assets	-1.360*	-1.880	-1.698**	-2.420
Cash/Assets	3.670***	5.560	3.626***	5.690
Dividend per share	5.025***	3.550	5.238***	4.070
Dummy 1989	-0.221	-0.330		
Dummy 1991	0.060	0.100		
Dummy 1992	-1.402	-1.630		
Dummy 1993	-1.267	-1.490		
Dummy 1994	-0.337	-0.520		
Dummy 1995	-0.347	-0.550		
Dummy 1996	-0.094	-0.160		
Dummy 1997	0.541	1.000		
Dummy 1998	0.532	1.010		
Dummy 1999	-0.008	-0.010		
Dummy 2000	0.458	0.900		
Dummy 2001	-0.123	-0.240		

Notes: ***, **, * – significant at the 1%, 5% and 10% level respectively. The dependent variable is a dummy variable which takes value 1 if a company announces a buyback, 0 otherwise. The independent variables are: M/B namely the Market to Book ratio; Ebitda/Cash Adjusted Assets namely the ratio between Earnings before tax depreciation and amortization and the book value of total assets net of cash and marketable securities; Earnings/Sales namely the Earnings to Sales ratio; Log(Assets) is the logarithm of the asset value; Debt/Assets is the ratio between the financial debt and the total asset; Cash/Assets is the ratio between cash and total assets; Dividend per share. The first column reports the estimated coefficients for all the variables. The second column reports the results excluding the variables not significantly different from zero in the first model.

In Table 8 and Table 9 we show the results of the analysis about differences in the operating performance between the sample and their counterparts selected according to the PSM algorithm.

For the sample as a whole, on average, the operating performance reported in Table 8, after the announcement year, is poorer [-3.03%] than the control sample. The median value provides analogous results in t_1 [-1.18%]. Both the numbers are statistically different from zero at the 5% and at the 10% level respectively. We detect a differential negative performance even before the announcement. Again, no statistically significant difference characterizes companies that do not effectively engage in a buyback.

Also referring to the operating performance growth, as reported in Table 9, the results seem to confirm prior findings. On average we detect a differential growth rate after the announcement [-2.93%] significantly different from zero at the 5% level.

Companies that effectively buy back shares exhibit weaker growth rate after the announcement, while no differences are highlighted for the companies that do not repurchase shares.

We conclude that the data show a significant worsening of the operating performance subsequent to a buyback announcement, both in absolute terms and benchmarking with a control sample of matching companies. The poor operating performance is par-

Table 8. Companies' operating performance with propensity score matching

Period	All announcements			Announcements with buyback			Announcements with no effective buyback		
	Obs	Mean	Median	Obs	Mean	Median	Obs	Mean	Median
t_{-2}	127	-4.51%**	-2.07%**	78	-5.71%*	-3.17%*	49	-2.60%	-1.63%
t_{-1}	134	-4.52%**	-1.27%***	81	-6.26%**	-1.20%*	53	-1.84%	-1.34%
t_0	134	-0.10%	-0.06%	81	-1.43%	1.82%	53	1.93%	-0.45%
t_1	134	-3.03%**	-1.18%*	81	-4.69%***	-1.61%	53	-0.49%	-0.14%
t_2	131	-3.33%**	-1.45%	79	-5.98%***	-3.11%***	52	0.69%	1.84%
t_3	122	-0.57%	0.77%	72	0.15%	2.34%	50	-1.61%	0.68%

Notes: ***, **, * – significant at the 1%, 5% and 10% level respectively. Differences in the operating performance between companies announcing a stock repurchase and companies belonging to the control sample, built with the "propensity score matching" method. The performance indicator is EBITDA/Cash Adjusted Assets ratio. t_0 is the year of the buyback announcement.

Table 9. Companies' operating performance growth rate with propensity score matching

Period	All announcements			Announcements with buyback			Announcements with no effective buyback		
	Obs	Mean	Median	Obs	Mean	Median	Obs	Mean	Median
$\Delta(t_{-2}, t_{-1})$	127	-0.84%	0.28%	78	-0.98%	0.79%	49	-0.61%	0.03%
$\Delta(t_{-1}, t_0)$	134	4.41%***	1.32%	81	4.83%**	1.27%**	53	3.77%	1.45%
$\Delta(t_0, t_1)$	134	-2.93%**	-0.53%	81	-3.26%***	-1.33%**	53	-2.42%	0.59%
$\Delta(t_1, t_2)$	131	-0.18%	-0.17%	79	-1.22%	-1.23%	52	1.41%	0.59%
$\Delta(t_2, t_3)$	122	1.63%	0.50%	72	4.40%***	1.48%***	50	-2.35%*	-2.07%*

Notes: ***, **, * – significant at the 1%, 5% and 10% level respectively. Differences in the operating performance growth rate between companies announcing a stock repurchase and companies belonging to the control sample, built with the "propensity score matching" method. The performance indicator is EBITDA/Cash Adjusted Assets ratio. t_0 is the year of the buyback announcement.

ticularly significant for companies that effectively buy back the shares after the announcement, while no significant difference is detected for remaining firms.

Conclusion

We analyze the operating performance of industrial companies listed on the Italian Stock Exchange that announced a buyback from 1989 to 2001. We consider three different samples: 160 companies that announced a stock repurchase for the first time; 99 firms that really carry out a buyback after the announcement; 61 companies that, on the contrary, did not effectively engage in a buyback.

The operating performance is determined through the EBITDA/Cash Adjusted Assets ratio, as well as through alternative indicators.

We find a significant worsening of the operating performance subsequent to the announcement, both in absolute terms and compared to a control sample of matching companies. The poor operating performance is particularly significant for companies that effectively buy back the shares after the announcement, while no significant difference is detected for other firms.

The positive abnormal returns that generally are associated to a stock repurchase announcement are more consistently explained by the "Free Cash Flow Hypothesis" than by the "Signalling Hypothesis". Stock repurchases are considered as the commitment that the company is ready to pay back cash to shareholders, given that the profitability will decrease.

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