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Abstract

We analyze the decision to announce an open market share repurchase and the share price reaction to the announcement. We use a conditional estimation approach which takes into account that the repurchase decision is made rationally and that, consequently, there is a potential selection bias. This approach requires a 'non-event sample' of firms that could reasonably be expected to announce a repurchase but did not. The specific institutional rules for share repurchases in Germany allow us to construct such a sample. We find that a conditional approach yields results that are qualitatively comparable but differ in detail from those obtained using a non-conditional approach. We confirm earlier findings of negative share price performance prior to the repurchase announcement and positive and significant announcement day abnormal returns. The results of our probit models are consistent with the free cash flow hypothesis and provide at least partial support for the rent extraction, signalling and capital structure hypothesis. The results of the cross-sectional regressions provide strong support for the signalling hypothesis once we control for selection bias.

Keywords: Repurchases, Event Study, Selection Bias

JEL-Classification: G14, G35

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1 Introduction

Since the early studies by Dann (1981) and Vermaelen (1981) it is a stylized fact that share prices react positively to the announcement of share repurchases. Academic research has proposed a considerable number of hypotheses (to be briefly reviewed in section 3) aiming to explain this finding, and a large number of empirical papers have tested them.

The usual approach in these studies is to construct a sample of firms announcing repurchases, to estimate the announcement period abnormal returns using event study methodology, and to finally regress the abnormal returns on a set of explanatory variables. A potential problem with this approach is that it implicitly assumes that the set of announcing firms is a random sample of the population of all listed firms. However, managers decide rationally whether or not to announce a repurchase program. Evidence from empirical studies that model the decision to repurchase (e.g. Jolls, 1998; Dittmar, 2000; Jagannathan et al., 2000; Kahle, 2002; Von Eije and Megginson, 2008; Oswald and Young, 2010; Andriosopoulos, 2010) suggests that repurchasing firms are systematically different from non-repurchasing firms. Similarly, the significant negative pre-announcement abnormal returns documented in previous studies (e.g. Vermaelen, 1981; Comment and Jarrell, 1991; Stephens and Weisbach, 1998) indicate that the announcements are 'timed'; i.e., are contingent upon the share price performance. Thus, there is a potential selection bias.

Acharya (1988) develops an econometric methodology that corrects for the potential selection bias. It is similar in spirit to Heckman (1979). Prabhala (1997) analyzes under what conditions this procedure performs well. He states (p. 32) that this is the case 'only when one has, in addition to data on firms announcing the event, a set of non-event firms, that is, firms that were partially anticipated to announce but chose not to announce the event in question'. He then concludes (p. 33) that 'when the necessary non-event data are available, inference should be based on conditional methods'.

Unfortunately, non-event data is unavailable in most applications. In this regard, the institutional rules for share repurchases in Germany are an exception. As explained in more detail in section 2, the shareholders' meeting first has to approve a share repurchase program. The approval is valid for up to 18 months (up to 5 years since 2008) and allows the managerial board to initiate a repurchase program. The board is, however, not obliged to do so. If the managerial board decides to repurchase shares this fact is publicly announced. This two-step process allows us to construct an event sample (firms with approval from the shareholders' meeting that did announce a repurchase program) and a non-event sample (firms with approval from the shareholders' meeting that did not announce a repurchase program).

We use this specific setup to estimate a joint model of a) the decision to initiate a repurchase program and b) the determinants of the event date abnormal returns. We also compare the

results obtained using this conditional model to those obtained using the traditional non-conditional approach.

We are aware of two papers that use a conditional approach to analyze the information content of repurchase announcements. Li and McNally (2007) use a sample of Canadian firms that announced a repurchase program (the event sample) and a size- and industry-matched sample of non-repurchasing firms (the nonevent sample). This sample selection procedure is based on the assumption that market participants assign a non-trivial repurchase probability to the sample of matched firms. Schremper (2003) analyzes German firms. He uses a sample of all non-repurchasing firms as non-event sample. This approach implicitly assumes that the market attaches a non-trivial repurchase probability to all listed firms.

Our paper contributes to the literature in several ways. First, our paper is one of the first studies to analyze the determinants of repurchase announcements and the determinants of the announcement date abnormal returns jointly. Second, as outlined above the specific institutional setting in the German stock market allow us to construct a non-event sample of firms that already obtained shareholders' approval to initiate a repurchase program. With such a non-event sample at hand the conditional event study methodology we employ is appropriate. We do not have to rely on a matched sample approach as used by Li and McNally (2007), and neither do we have to assume that all firms are expected to repurchase with a non-trivial probability as in Schremper (2003). Third, we improve on the methodology used in previous papers by estimating the first-stage probit model and the second-stage cross-sectional regression simultaneously. This procedure increases the efficiency of the estimates. We find that the conditional estimation approach yields results that are qualitatively comparable but differ in detail from those obtained using a non-conditional approach. We further confirm earlier findings of negative share price performance prior to the repurchase announcement and positive and significant announcement day abnormal returns. The results of our probit models are consistent with the free cash flow hypothesis and provide at least partial support for the rent extraction, signalling and capital structure hypothesis. In addition, the results of the cross-sectional regressions provide strong support for the signalling hypothesis once we control for the selection bias. We find only weak support for the free cash flow and rent extraction hypothesis.

The remainder of the paper is structured as follows. In section 2 we describe the institutional setting in Germany. In section 3 we develop our hypotheses. Section 4 describes the methodology and the data set. We present our results in section 5, section 6 concludes.

2 Institutional Background

Approving Repurchases

Until 1998 share repurchases were essentially prohibited in Germany.[1] In 1998 a new law came into force that allows share repurchases. Under this law firms are allowed to buy back up to 10% of their shares. A firm wishing to buy back shares has to follow a standardized two-step procedure. As a first step the shareholders' meeting (with simple majority) has to grant the managerial board the permission to buy back shares. This permission has to specify the maximum number of shares to be bought back (not more than 10% of shares outstanding), the minimum and maximum price to be paid per share, and the time of validity of the permission (initially not longer than 18 months; since 2008 no longer than 5 years).

This permission gives the managerial board the right, but not the obligation, to buy back shares. Once the board decides to actually initiate a repurchase program the firm has to communicate this fact to the public. This is mandated by the German securities trading act (Wertpapierhandelsgesetz), which requires that listed firms immediately disclose information that is likely to materially affect security prices ('ad-hoc disclosure'). Empirical studies analyzing the impact of repurchase announcements on share prices typically use the date of the ad-hoc disclosure as the event date (e.g. Gerke et al., 2003; Schremper, 2003; Seifert and Stehle, 2003; Hackethal and Zdantchouk, 2006; Bessler et al., 2009).

The two-step approval procedure with the permission from the shareholders' meeting at the first stage and the decision of the managerial board at the second stage is important for our analysis. Our simultaneous estimation procedure requires a control group of firms that did not initiate a repurchase program but could reasonably be expected to do so. We choose firms that got approval from the shareholders' meeting but did not announce a repurchase program. The managerial board of these firms could have initiated a repurchase program at any time. Therefore, investors would reasonably attach a non-trivial probability of announcing a repurchase program to these firms. This claim is supported by empirical results reported in Hackethal and Zdantchouk (2006). These authors analyze the share price reaction on the day on which it becomes known that the management seeks shareholders' approval for a repurchase program. They find a positive abnormal return of 1.47% on the event date and a cumulative abnormal return of 2.53% [5.21%] in a symmetric 3-day [11-day] window around the event date. The result that share prices increase when the management seeks approval for a repurchase

[1] Firms could acquire their own shares only under restrictive conditions (e.g. to prevent damage). Although there is some disagreement in the literature as to the actual number of repurchases in Germany prior to 1998 (see Seifert 2006 for a discussion) it is safe to conclude that share repurchases were not used as a means of disbursing cash to shareholders prior to 1998.

program from the shareholders' meeting supports our claim that market participants attach a non-trivial probability of initiating a repurchase program to firms that obtained approval from the shareholders' meeting.

Implementation of Repurchase Programs

Firms are required to treat all shareholders equally. This precludes negotiated repurchases from large shareholders. Open market repurchases, repurchase tender offers and transferrable put rights are admissible, though open market repurchases are the dominating form.[2] As is the case in the U.S., the announcement of a share repurchase still does not require the managerial board to actually repurchase shares. The actual amount of repurchases is published in the firm's financial statement.

Since 2004 new European Union regulation imposes additional restrictions on repurchases. Individual transactions made as part of a repurchase program now have to be reported within seven trading days. Further, there are restrictions on the prices at which open market repurchases can be made (not higher than the price of the previous transaction) and on the maximum daily repurchase volume (not more than 25% of the average daily volume on the market on which the trade is made).

There are two ways in which a firm can handle the repurchased shares. First, it can treat them as an asset on the asset side of the balance sheet. They can then be used to cover outstanding convertible bonds or executive stock options. The maximum number of shares a firm can hold on its balance sheet is 10% of the shares outstanding. Alternatively, the firm can reduce the number of shares outstanding. In this case the firm's book equity is reduced accordingly.

Tax Treatment

The tax treatment of dividends and repurchases underwent a major change in 2001. Until 2001 Germany operated a full imputation system. Dividends paid to domestic investors were essentially taxed at the investor's personal tax rate.[3] Retained earnings were taxed at a corporate tax rate. Consequently, investors with a personal tax rate below the corporate rate favored dividends over repurchases while investors with a tax rate above the corporate rate

[2]Out of 589 repurchase announcements in our sample, only 17 (less than 3%) do not concern open market repurchases.

[3]Dividends were first taxed at the firm level. Domestic investors received the gross dividend plus a tax credit equal to the tax paid by the firm. The gross dividend was taxed at the investor's personal tax rate. The resulting tax liability was then offset against the tax credit.

favored repurchases.[4] Corporations should have been indifferent because their 'personal' tax rate is the corporate rate. Foreign investors did not receive the tax credit and may therefore have had a preference for repurchases.

Since 2001 dividends and retained earnings are taxed at the same rate at the corporate level. At the investor level half of the gross dividend is taxed at the investor's personal tax rate. Capital gains are not taxed when the shares are held for more than one year. When this condition is met investors should thus have a clear preference for repurchases over dividends.

In summary, while the preference for dividends versus repurchases depended on the status (domestic versus foreign) and the personal tax rate of the investor prior to 2001, there should be a clear preference for repurchases after 2001.

3 Hypotheses

Starting with the seminal work of Dann (1981) and Vermaelen (1981) a large number of authors have empirically analyzed share repurchase programs. Three main questions are addressed in this literature: (1) why do firms repurchase shares, (2) how does the share price react to repurchase announcements and (3) on what determinants does the price reaction depend. The theoretical and empirical literature proposes several hypotheses that are not mutually exclusive. We briefly discuss these hypotheses in this section, and we summarize them in Table 1.

According to the *signalling hypothesis*, managers repurchase shares in order to signal private information implying that the firm is currently undervalued. By this argument, the likelihood for a repurchase should be higher for firms with lower valuation (as measured by Tobin's Q, the market-to-book ratio or previous share price performance), and it should be higher when informational asymmetries between managers and investors are more pronounced. This is likely to be the case for smaller firms. The share price reaction caused by a repurchase announcement should be inversely related to these measures of valuation and informational asymmetries. Further, larger repurchase programs and repurchase announcement made by firms with higher managerial ownership in combination with a poor stock performance should trigger larger share price reactions because they provide more credible signals.[5]

The starting point of the *free cash flow hypothesis* is the agency conflict between shareholders and managers. Repurchases reduce the free cash flow and may thereby reduce agency costs.

[4]This statement implicitly assumes that capital gains are not taxed. This was indeed the case when the shares were held longer than 6 months (one year from 1999 onwards).

[5]In case a repurchase is conducted by means of a tender offer the share price reaction should be increasing in the offer premium. Our empirical analysis is confined to open market repurchases to which this argument does not apply.

They should thus be more likely in firms in which the agency problem is more severe. By this argument, firms with higher levels of free cash flow, firms with fewer profitable investment opportunities (as measured by Tobin's Q or the market-to-book ratio) and firms with lower leverage should be more likely to announce a repurchase program. The market should also react more positively to repurchase announcements made by these firms. Self-interested managers may not voluntarily initiate repurchase programs. Therefore, firms with large shareholders (who can exert pressure on managers) are more likely to initiate a repurchase program.

The *rent extraction hypothesis* (Gugler and Yurtoglu, 2003) starts from the observation that, in countries with concentrated ownership structures such as Germany, there may not only be agency conflicts between shareholders and managers but also agency conflicts between large and small shareholders (e.g. La Porta et al., 2000). These conflicts are likely to be more pronounced when a large shareholder holds voting rights in excess of cash flow rights. A repurchase program deprives a firm of cash that otherwise might be diverted by large shareholders. Thus, if a firm with a strong blockholder announces a repurchase program, the share price should react favorably to the announcement. Consequently, the announcement date abnormal return should increase in the stake of the largest shareholder and decrease in the cash-flow-to-voting-rights ratio.[6] By the same argument, large blockholders may be opposed to repurchase programs. Therefore, the likelihood of a repurchase announcement should decrease in the stake of the largest shareholder and increase in the cash-flow-to-voting-rights ratio.

A large second shareholder may contain the power of the largest shareholder (see Gugler and Yurtoglu, 2003). Consequently, the likelihood of a repurchase announcement should increase in the stake of the second largest shareholder while the price reaction to the announcement should be decreasing in the stake of the second largest shareholder.

Several hypotheses make predictions about the determinants of the choice between dividends and repurchases. We subsume them under the header *choice of payout method*. A firm's choice of the payout method should be governed by the relative tax treatment of dividends and repurchases and by the tax preferences of the firm's shareholders. As outlined in section 2 the 2001 tax reform favored repurchases over dividends. We therefore expect a higher probability for a repurchase in the post-reform period. Prior to 2001 investors in high tax brackets favored repurchases while those in low tax brackets favored dividends. According to the tax clientele hypothesis one would therefore expect firms with high dividend yields to predominantly have investors in low tax brackets and firms with low dividend yields to have investors in high tax brackets. As the latter investors favor repurchases over dividends we thus expect an inverse

[6] A low cash-flow-to-voting-rights ratio indicates deviations from the one-share-one-vote principle. Consequently, the higher the cash-flow-to-voting-rights ratio the better aligned are the incentives of small and large shareholders.

relation between dividend yield and the probability of a repurchase.

Jagannathan et al. (2000) provide evidence that dividends are paid out of permanent cash flows while repurchases are paid out of transitory cash flows. Firms with more volatile cash flows are more likely to experience transitory changes in cash flows and should thus be more likely to repurchase shares. This argument implicitly assumes that managers prefer to smooth dividends. If a firm - for whatever reason - prefers not to smooth its dividends, there is no reason for this firm to use repurchases to disburse transitory cash flows. Consequently, we expect that firms with a history of volatile dividends are less likely to initiate a repurchase.

Managerial stock options are typically not dividend-protected. Consequently, their value decreases when a firm pays dividends. Managers in firms with stock option plans may therefore prefer repurchases over dividends (Jolls, 1998; Kahle, 2002). As noted earlier, repurchased shares can be used to service existing stock-option plans. Since repurchases conducted with this intention do not signal positive information, repurchase announcements made by firms with stock option plans should trigger lower abnormal returns.[7]

The *capital structure hypothesis* posits that repurchases may be used as a means to adjust a firm's capital structure to its target level. Accordingly, firms with below-target leverage levels should be more likely to announce a repurchase (Hovakimian et al., 2001). To the extent that firm value depends on the distance between the actual and the target capital structure the abnormal return triggered by a repurchase announcement should be increasing in this distance.

Survey evidence presented by Brav et al. (2005) suggests that managers are concerned about earnings per share (EPS). We therefore include earnings per share in our empirical model. As there is no economic rationale for the *EPS hypothesis* we do not expect a particular sign for the coefficient.

[Insert Table 1 here]

4 Methodology and Data

The objective of our regression analysis is a joint estimation of (a) the likelihood to initiate a repurchase program and (b) the determinants of the event date abnormal returns. Step (b) requires event study cumulative abnormal returns as an input. Therefore we first describe the event study that we perform. We then describe the joint conditional estimation approach we employ. While doing so we also discuss the traditional non-conditional approach and highlight

[7]Unfortunately, data on the existence of stock option plans is unavailable for our sample. We are therefore unable to test this hypothesis empirically.

its potential disadvantages. The final subsection describes our data set and presents descriptive statistics.

Event Study

We measure the stock price reaction to open-market repurchase announcements applying standard event-study methodology. The abnormal return of firm i on day is defined as the difference of the realized return and the expected return based on the market model (Brown and Warner, 1985):[8]

$$AR_{i,\tau} = R_{i,\tau} - (\widehat{\alpha}_i + \widehat{\beta}_i R_{m,\tau}) \tag{1}$$

where $AR_{i,\tau}$ is the abnormal return of firm i on day τ and $R_{m,\tau}$ is the return of the proxy for the market portfolio on day τ. The coefficients $\widehat{\alpha}_i$ and $\widehat{\beta}_i$ in equation (1) are OLS estimates obtained from a regression of firm i's daily returns on the market portfolio (and a constant) over a period of 160 trading days ending 21 days before the announcement. We use the CDAX index as our proxy for the market portfolio.

Daily average abnormal returns are then calculated for each day of the event period as the cross-sectional arithmetic mean of the abnormal returns:

$$AAR_{\tau} = \frac{1}{N} \sum_{i=1}^{N} AR_{i,\tau} \tag{2}$$

where N is the total number of firms in the sample. The cumulative average abnormal return from day τ_1 to day τ_2 is given by:

$$CAAR_{\tau_1,\tau_2} = \sum_{\tau=\tau_1}^{\tau_2} AAR_{\tau} \tag{3}$$

We test the statistical significance of AARs and CAARs applying a simple time-series test (Brown and Warner, 1985). Since deviations from the iid normal assumption of the aforementioned test are highly likely in event studies, we additionally apply various robust test statistics. We calculate the Patell (1976) standardized residuals test that is robust to heteroscedastic event-period abnormal returns. Moreover, we apply the standardized cross-sectional test introduced by Boehmer et al. (1991) that is additionally robust to event-induced variance increases. In case of non-normality of the abnormal returns the former three parametric tests may be poorly specified. Therefore, we also apply the non-parametric Corrado and Zivney (1992) rank

[8] In an unreported robustness check we alternatively use the constant mean return model. The results are virtually identical.

test and the Cowan (1992) generalized sign test.

We additionally measure the abnormal trading volume applying the methodology described in Brav and Gompers (2003). We expect that the abnormal trading volume is virtually zero over the pre- and post-announcement periods, but significantly increases during the announcement period.

The conditional estimation approach

The traditional approach to analyze the determinants of the event study CARs is to regress individual abnormal returns on a set of explanatory variables using OLS. The corresponding cross-sectional regression equation can be written as:

$$CAR_i = X_i\beta + \epsilon_i \tag{4}$$

where CAR_i denotes the cumulative abnormal return of event i, X_i is a vector of explanatory variables, and ϵ_i an error term assumed to be normally distributed. The traditional approach implicitly assumes that the sample of firms announcing a repurchase is a random sample from the population of all listed firms. However, provided that the shareholders' meeting has granted permission to buy back shares managers decide rationally on whether or not to announce a repurchase. In order to account for the resulting selection bias we adopt the general selection model proposed by Acharya (1988) and analyzed in detail by Prabhala (1997). The cross-sectional regression is augmented by a selection equation that models a firm's decision whether or not to announce a repurchase. Managers are assumed to announce a repurchase ($REP_i = 1$) when the marginal utility U_i^* of doing so is strictly positive. Otherwise they do not announce a repurchase ($REP_i = 0$). U_i^* is modeled as a linear function of exogenous, publicly observable variables W_i:

$$U_i^* = W_i\gamma + \eta_i \tag{5}$$

where η_i is an error term assumed to be normally distributed and orthogonal to W_i. Since market participants only observe the binary outcome REP, and since announcement day abnormal returns are only observed for announcing firms, we finally obtain the system:

$$REP_i = 1 \Leftrightarrow U_i^* = W_i\gamma + \eta_i > 0 \tag{6}$$

$$REP_i = 0 \Leftrightarrow U_i^* = W_i\gamma + \eta_i \leq 0 \tag{7}$$

$$CAR_i = X_i\beta + \epsilon_i \;\; if \; REP_i = 1 \tag{8}$$

Estimation of the selection model requires a sample of event firms (firms that announced a repurchase) and a sample of non-event firms.

When estimating the abnormal return equation (8) we explicitly account for the fact that the dependent variable (the CAR following the repurchase announcement) is only observed for the subsample of repurchasing firms. In order to demonstrate under which circumstances the traditional approach leads to inconsistent estimates we take the conditional expectation of equation (8).

$$E\left[CAR_i \mid REP_i = 1\right] = X_i\beta + E\left[\epsilon_i \mid REP_i = 1\right] = X_i\beta + E\left[\epsilon_i | \eta_i > -W_i\gamma\right] \tag{9}$$

Following Heckman (1979) we further assume that ϵ_i and η_i follow a bivariate normal distribution:

$$\begin{aligned} \eta_i &\sim N(0,1) \\ \epsilon_i &\sim N(0,\sigma_\epsilon) \\ corr(\eta_i, \epsilon_i) &= \rho \end{aligned} \tag{10}$$

Given this assumption we can express the expected value of ϵ_i given η_i as:

$$E\left[\epsilon_i \mid \eta_i > -W_i\gamma\right] = \rho\sigma_\epsilon E\left[\eta_i \mid \eta_i > -W_i\gamma\right] = \rho\sigma_\epsilon \frac{\phi(W_i\gamma)}{\Phi(W_i\gamma)} = \rho\sigma_\epsilon\lambda_i(W_i\gamma) \tag{11}$$

Inserting equation (11) into equation (8) yields:

$$E[CAR_i \mid REP_i = 1] = X_i\beta + \rho\sigma_\epsilon\lambda_i(W_i\gamma) = X_i\beta + \beta_\lambda\lambda_i(W_i\gamma) \tag{12}$$

A comparison of equation (12) with equation (4) shows that applying the traditional approach leads to inconsistent estimates whenever the error terms of the selection model and the abnormal return equation are correlated.

Heckman (1979) argues that self-selection can be interpreted as an omitted variable problem. He therefore proposes a two-step estimator for eqs. (6)-(8). In a first step he estimates the selection equation by means of a probit model. He then calculates the fitted correction factor, the inverse Mill's ratio:

$$\widehat{\lambda}_i(W_i\gamma) = \frac{\phi(W_i\widehat{\gamma})}{\Phi(W_i\widehat{\gamma})} \tag{13}$$

Finally, he estimates the parameters of the abnormal return equation with the fitted correction

factor as an additional explanatory variable. The second-stage regression is then estimated by least squares. Assuming bivariate normality, this approach yields consistent estimates. However, a joint estimation of eqs. (6)-(8) using maximum likelihood (ML) estimation results in more efficient estimates and allows to test if the correlation coefficient ρ is significantly different from zero.

So far we have treated self-selection as a purely econometric issue. However, Li and Prabhala (2007) emphasize the 'dual nature' of the inverse Mill's ratio. In our self-selection mechanism we assumed that is the part of U_i^* that is not explained by the publicly observable regressors W_i. Because η_i is an error term orthogonal to the publicly observable regressors W_i we can interpret it as private information of the managers. From the point of view of investors who cannot observe the managers' private information, the unconditional expected value of η_i is zero. When investors observe that a firm announces a repurchase, they can update their expectation of the managers' private information η_i. This private information revealed by the repurchase announcement should affect the stock price reaction to the announcement. We can test whether this is the case by including $E[\eta_i \mid REP_i = 1]$ as an additional explanatory variable in the abnormal return equation (4). According to equation (13) this additional variable is equivalent to the inverse Mill's ratio. Hence, a correction for self-selection coincidently allows to test for the influence of private information on announcement period abnormal returns. If the managers private information that affected their decision to initiate a repurchase program is at least partially revealed by the repurchase announcement, we expect a positive relation between the private information and the event period abnormal return.

Data and descriptive statistics

In this section, we provide a description of the sample selection and event identification process. To analyze the decision to initiate a repurchase program and to quantify the share price reaction after the subsequent announcement, we consider all non-financial firms included in the German Composite DAX index (CDAX).[9] Our sample period extends from May 1998 to December 2008.

As outlined above, our methodology requires a sample of firms announcing a repurchase program and an additional sample of firms that could reasonably be expected to announce a repurchase program but did not. To construct these two samples, we apply the following criteria throughout our analyses. First, we only consider firms with a valid approval of the shareholders' meeting that allows the managerial board to initiate a repurchase program. These approvals

[9]The CDAX is a broad stock index that contains all German firms listed in the two major market segments 'General Standard' and 'Prime Standard'

have to be reported both in the annual reports and have to be filed with the 'Bundesanstalt fuer Finanzdienstleistungsaufsicht' (BaFin).[10] The BaFin maintains a database of reported approvals. We use this database as our starting point. Because it is incomplete, we hand-collect additional cases from annual reports.

In a second step we divide all firms with a valid approval into a sample of repurchasing and a sample of non-repurchasing firms. A firm is identified as a repurchasing firm if it publicly announces the initiation of a repurchase program through an ad-hoc disclosure announcement. We collect the announcements from the electronic databases of DGAP[11], Euroadhoc[12], and firms' websites. We obtain announcement dates and timestamps. This procedure results in an initial sample of 589 announcements. We exclude 17 announcements that relate to non-open-market repurchases. To avoid biases induced by confounding events we further exclude 134 announcements where other price-relevant information is disclosed during the event period. The remaining 438 announcements made by 238 different firms constitute our sample of repurchasing firms. Firms often state explicit reasons for the repurchase program in the announcement. Results of previous research (Gerke et al., 2003; Seifert and Stehle, 2003; Hackethal and Zdantchouk, 2006) suggest that the stated reason has an impact on the share price reaction to the announcements. We therefore record the stated reasons and code them into a set of dummy variables.[13] These are included in the abnormal return equation.

In a final step we randomly assign a non-repurchasing firm to each firm announcing a repurchase program. The non-repurchasing firms are selected from the population of firms that possess an approval from the shareholders' meeting but did not announce a repurchase program during the whole period for which the approval was valid. Information for the matched firm is recorded on the day on which the event firm made its repurchase announcement.

Additional data is obtained from various sources. We collect share price data, trading volume, and annual accounting data from *Thomson Reuters Datastream*. All book values are as of the fiscal year before the announcement, whereas market values are based on the third trading day before the announcement. Following Comment and Jarrell (1991) and Bessler et al. (2009) we measure individual past share price performance over the 50 trading days ending on the third trading day before the announcement.

The *free cash flow hypothesis* and the *rent extraction hypothesis* predict that the ownership

[10]The Bundesanstalt fuer Finanzdienstleistungsaufsicht (BaFin), the German analogue to the Securities and Exchange Commission, is the federal authority charged with the supervision of securities trading.

[11]DGAP- 'Deutsche Gesellschaft fuer Ad-hoc Publizitt mbH': www.dgap.de

[12]Euroadhoc: www.euroadhoc.com

[13]We use the categories 'underperformance', 'excess cash', 'capital structure', 'acquisition' and 'stock option program'. Firms that do not state a reason in their announcements (all remaining) are the base case.

structure of a firm potentially affects the likelihood of a repurchase announcement as well as the share price reaction to such an announcement. We therefore collect data on disclosed holdings of voting shares for the two largest shareholders from *Hoppenstedt Aktienfuehrer*.[14] We further calculate the ratio of cash flow rights to voting rights for the largest shareholder. This variable proxies for deviations from the one-share-one-vote principle.

[Insert Table 2 here]

Table 2 provides a detailed description of all explanatory variables we use in our regressions. Table 3 contains descriptive statistics for the event firms and the non-event firms. The event firms have lower market-to-book ratios, higher free cash flows, are less leveraged and have less concentrated ownership (as evidenced by a slightly lower share of the largest shareholder). There are no significant differences with respect to share price performance, size, and dividend yield.

[Insert Table 3 here]

5 Results

We present and discuss our empirical results in three steps. We start by presenting the results of the probit model. We then describe the results of our event study and finally those of the cross-sectional regression. The objective of the discussion is twofold. First, we wish to analyze whether our conditional approach yields results that are different from those obtained using the traditional approach. Second, we are interested in the economic motives underlying the repurchase decision and in the determinants of the share price reaction to the repurchase announcement.

[14] We only consider shareholdings larger than 5% since this is the legal reporting threshold for the most part of our observation period. German listed firms typically exhibit a complex structure of corporate ownership. Pyramiding and cross ownership as well as the use of dual-class shares can induce a wedge between cash flow and voting rights. Hence, we do not rely on shareholdings on the first-tier but follow the procedure proposed by Da Silva et al. (2004) to identify the ultimate controlling shareholder. Based on this methodology, the ultimate controlling shareholder is situated at the first-tier if (i) there is no shareholder holding at least 25% of the voting shares, or (ii) the largest shareholder holding more than 25% is a bank, insurance company, the German state, a foreign company or institution, or a family/individual. In all other cases, the ultimate controlling shareholder is said to be at a higher tier which is reached if criteria (i) or (ii) are satisfied. If a widely held firm is reached at a higher layer, the ultimate control lies with this corporation. In order to track shareholdings from the first-tier to ultimate controlling levels we use (in addition to the *Hoppenstedt Aktienfuehrer*) *Commerzbank-Wer gehoert zu Wem*, a publication on ownership of German firms.

Probit model - the decision to repurchase

The results of the probit models are shown in Table 4. The column labelled 'Probit' reports the results that we obtain when we estimate the probit model separately. The column labelled 'ML' contains the results that we obtain when we estimate the probit model and the cross-sectional regression jointly. The two sets of results are qualitatively similar. We find that the probability for a repurchase is decreasing in the market-to-book ratio and in leverage, and is increasing in the free cash flow, the interaction between cash holdings and the low market-to-book dummy, and the cash-flow-to-voting-rights ratio. We further find that the component stocks of the high-technology index Nemax are more likely to initiate a repurchase.

[Insert Table 4 here]

The variables included in the probit model proxy for the signalling hypothesis, the free cash flow hypothesis, the rent extraction hypothesis, the dividend substitution hypothesis and the capital structure hypothesis. Table 5 visualizes the results in a way which facilitates their interpretation. It shows the competing hypotheses, the independent variables which proxy for them, their expected sign and the actual results.

These results are consistent with the free cash flow hypothesis, which correctly predicts that the repurchase probability depends positively on the free cash flow and the interaction between cash holdings and the low market-to-book dummy and depends negatively on the market-to-book ratio and leverage. The result that the repurchase probability is positively related to the cash-flow-to-voting-rights ratio is consistent with the rent extraction hypothesis. The evidence with respect to the signalling and capital structure hypothesis is difficult to interpret because the negative coefficients on the market-to-book ratio and the leverage ratio are also predicted by the free cash flow hypothesis. We find no support for a choice of repurchases that is motivated by the tax system or the tax preferences of the firm's shareholders.

[Insert Table 5 here]

Event study results

The event study results are shown in Table 6 and Figure 1. Consistent with the previous literature we find large positive abnormal returns. The event day abnormal return is 3.21% and is significant at better than the 1% level. The three-day cumulative abnormal return is slightly larger at 3.55% and is also highly significant. As can be seen from Figure 1 the trading volume is abnormally high on the event day (at more than 250% of its normal level) and stays at an elevated level for about eight trading days.

[Insert Table 6 here]

Consistent with previous results we find significantly negative abnormal returns prior to the event date. In the 18 [8] day window extending from day -20 [-10] until day -3, the cumulative abnormal return is -2.73% [-1.64%], significant at the 1% level. This pattern is consistent with timing attempts. Managers announce a repurchase after a period of negative share price performance. If such timing occurs, the occurrence of the event (the repurchase announcement) is non-random, and a conditional estimation approach is warranted.

[Insert Figure 1 here]

Cross-sectional regression

The results of the cross-sectional regression are shown in Table 7. The column labelled 'LS' shows the results of a simple OLS regression without correction for the selection bias. The column labelled 'Heckman' displays the results that we obtain when we estimate the cross-sectional regression separately but include the Mill's ratio from the first-stage probit model as an additional explanatory variable. The column labelled 'ML' contains the results of the simultaneous maximum likelihood estimation.

The results of the three models are qualitatively similar in many respects. However there are differences in detail which are worth mentioning. These differences lead us to other interpretations in the identification of potential value drivers after the announcement of open market share repurchases. Most importantly, the stake of the largest shareholder and the interaction term between managerial ownership and share price performance are insignificant in the LS model but turn significant once we control for selection bias. Furthermore, the coefficient on the Mill's ratio as proxy for the private information of managers is significant in the Heckman and the ML estimation. In the sequel we present and discuss the results of the ML estimation.

The CARs are significantly negatively related (minimum 5%-level) to the prior share price performance, to managerial ownership, the interaction term between managerial ownership and share price performance, and the interaction term between free cash flow and reason 'acquisition' dummy. Repurchase announcements by firms that are included in the high-tech index Nemax trigger higher CARs. With respect to the self-reported repurchase reasons we find that the CARs are larger when the firm announces that it repurchases shares because the management want to use the raised money to finance future acquisitions. Furthermore, firms that are controlled by large blockholders exhibit significantly higher returns after repurchase announcements.

[Insert Table 7 here]

Table 8 (constructed in the same way as Table 5 above) is intended to facilitate the interpretation of our findings. Our main finding is that once controlling for selection bias, the results provide strong support for the signalling hypothesis. The negative coefficient on the prior share price performance as well as the negative coefficient on the interaction term between managerial ownership and share price performance support the signalling hypothesis. We use the interaction term between managerial ownership and share price performance because when we employ simply managerial ownership as proxy we cannot distinguish the following two opposing effects: On the one hand, the signal on undervaluation seems to be more credible when the management owns a greater fraction of the shares. However, on the other hand, a greater managerial ownership could also mitigate potential agency problems and therefore reduce potential benefits of the repurchase to that end. Therefore, the more appropriate test for signalling credibility is in our view a test of the interaction term of underperformance and managerial ownership. The support for the signalling hypothesis is corroborated by the fact that the coefficient on the Mill's ratio in the Heckman model is positive and significant. As discussed in section 4, this finding can be interpreted in two different ways. First, in the original spirit of the Heckman approach, it indicates that the sample of firms announcing a repurchase is not random. Put differently, there is selection bias. Second, the significant coefficient implies that the repurchase announcement reveals private information (previously only held by the managers of the firm) to investors.

As is apparent from equation (9) above, the coefficient on the Mill's ratio is the product of the standard deviation of the error term ϵ_i and the correlation between the error terms in the probit model and the cross-sectional regression. The joint ML estimation approach allows us to decompose the coefficient into these two components and to separately test them for statistical significance. The results, reported in the third column of Table 7, indicate that both components are significant. As discussed in section 4 the significant correlation implies that the parameter estimates of the traditional (i.e., non-conditional) cross-sectional regression are inconsistent.

Furthermore, the significant and negative coefficient on the interaction term between free cash flow and reason 'acquisition' dummy and the positive and significant coefficient on the variable stake of largest shareholder lend partial support to the free cash flow and the rent extraction hypotheses. The latter finding cannot be confirmed by the LS and the Heckman specifications.

Overall, we can summarize that using a conditional estimation approach in the context of repurchase announcements leads not only to more efficient estimates but also, at least to a

certain extent, to the identification of different value drivers.

[Insert Table 8 here]

6 Conclusion

In this paper we jointly analyze the decision to announce an open market share repurchase and the share price reaction to the announcement. We use a conditional estimation approach. This approach takes into account that the repurchase decision is made rationally and that, consequently, there is a potential selection bias.

According to Prabhala (1997, p. 32) a conditional approach is warranted 'when one has, in addition to data on firms announcing the event, a set of non-event firms, that is, firms that were partially anticipated to announce but chose not to announce the event in question'. The institutional rules for share repurchases in Germany allow us to construct such a non-event control sample. The shareholders' meeting first has to approve a share repurchase program. The approval allows the managerial board to initiate a repurchase program but does not require it to do so. This two-step procedure allows us to construct an event sample (firms with approval from the shareholders' meeting that did announce a repurchase program) and a non-event sample (firms with approval from the shareholders' meeting that did not announce a repurchase program).

Our results demonstrate that a conditional estimation approach (which is preferable from a theoretical point of view) yields results that are qualitatively comparable but differ in detail from those obtained using a non-conditional approach. Most importantly, we find strong support for the signalling hypothesis once controlling for the selection bias. We therefore conclude that a conditional approach should be used whenever the requirements (i.e., the existence of a suitable non-event control group) are met.

Of course one could take an alternative point of view here and argue that the differences we document are not important enough to merit the additional complexity of the conditional estimation approach. Irrespective of the point of view, though, our paper makes one important contribution. It considers a setting that is well-suited for the (theoretically superior) conditional approach and documents how the results of the traditional and the conditional approach differ. This enables researchers to make a more informed choice of methodology.

Our event study results confirm earlier findings of negative share price performance prior to the repurchase announcement and positive and significant announcement day abnormal returns. The results of our probit models are consistent with the free cash flow hypothesis and provide at least partial support for the rent extraction, signalling and capital structure hypothesis. In

addition, the results of the cross-sectional regressions provide strong support for the signalling hypothesis once we control for selection bias. We find only weak support for the free cash flow and rent extraction hypothesis.

References

Acharya, S. (1988). A generalized econometric model and tests of a signaling hypothesis with two discrete signals. *Journal of Finance 43*, 413–429.

Andriosopoulos, D. (2010). The determinants of share repurchase announcements in europe. *unpublished working paper (University of Hull)*.

Bessler, W., W. Drobetz, and M. Seim (2009). Motives and valuation effects of share repurchase announcements in germany: A comparison of established firms and initial public offerings. *unpublished working paper (University of Giessen)*.

Boehmer, E., J. Musumeci, and A. Poulsen (1991). Event study methodology under conditions of event induced variance. *Journal of Financial Economics 30*, 253–272.

Brav, A. and P. Gompers (2003). The role of lockups in initial public offerings. *Review of Financial Studies 16*, 1–29.

Brav, A., J. Graham, R. Campbell, and R. Michaely (2005). Payout policy in the 21st century. *Journal of Financial Economics 77*, 483–527.

Brown, S. and J. Warner (1985). Using daily stock returns: The case of event studies. *Journal of Financial Economics, 14*, 3–31.

Comment, R. and G. Jarrell (1991). The relative signalling power of dutch-auction and fixed-price self-tender offers and open-market share repurchases. *The Journal of Finance 46*, 1243–1271.

Corrado, C. and T. Zivney (1992). The specification and power of the sign test in event study hypothesis tests using daily stock returns. *Journal of Financial and Quantitative Analysis 27*, 465–478.

Cowan, A. R. (1992). Nonparametric event study tests. *Review of Quantitative Finance and Accounting 2*, 343–358.

Da Silva, L. C., M. Goergen, and L. Renneboog (2004). *Dividend Policy and Corporate Governance*. Oxford University Press.

Dann, L. (1981). Common stock repurchases. *Journal of Financial Economics 9*, 113–137.

Dittmar, A. (2000). Why do firms repurchase stock. *Journal of Business 73*, 331–355.

Gerke, W., J. Fleischer, and M. Langer (2003). Kurseffekte durch aktienrckkufe eine empirische untersuchung fr den deutschen kapitalmarkt. *unpublished working paper (Universitt Erlangen-Nrnberg)*.

Gugler, K. and B. Yurtoglu (2003). Corporate governance and dividend pay-out policy in germany. *European Economic Review 47*, 731–758.

Hackethal, A. and A. Zdantchouk (2006). Signaling power of open market share repurchases in germany. *Financial Markets and Portfolio Management 20*, 123–151.

Heckman, J. (1979). Sample selection as a specification error. *Econometrica 47*, 153–161.

Hovakimian, A., T. Opler, and S. Titman (2001). The debt-equity choice. *Journal Financial and Quantitative Analysis 36*, 1–24.

Jagannathan, M., C. Stephens, and M. Weisbach (2000). Financial flexibility and the choice between dividends and stock repurchases. *Journal of Financial Economics 57*, 355–384.

Jolls, C. (1998). Stock repurchases and incentive compensation. *unpublished working paper, NBER Working Paper No. 6467*.

Kahle, K. (2002). When a buyback isnt a buyback: Open market repurchases and employee options. *Journal of Financial Economics 63*, 235–261.

La Porta, R., F. Lopez de Silanes, A. Schleifer, and R. Vishny (2000). Investor protection and corporate governance. *Journal of Financial Economics 58*, 3–29.

Li, K. and W. McNally (2007). The information content of canadian open market repurchase announcements. *Managerial Finance 33*, 65–80.

Li, K. and N. Prabhala (2007). *Self-Selection Models in Corporate Finance*. Handbook of Corporate Finance, Vol. 1.

Oswald, D. and S. Young (2010). Share reacquisitions, surplus cash, and agency problems. *Journal of Banking and Finance 32*, 795–806.

Patell, J. (1976). Corporate forecasts of earning per share and stock price behavior: Empirical tests. *Journal of Accounting Research 14*, 246–76.

Prabhala, N. (1997). Conditional methods in event studies and an equilibrium justification for standard event-study procedures. *Review of Financial Studies 10*, 1–38.

Schremper, R. (2003). Kapitalmarktrelevanz deutscher aktienrckkaufprogramme. *Zeitschrift fr betriebswirtschaftliche Forschung 55*, 578–605.

Seifert, U. (2006). *Aktienrckkufe in Deutschland: Renditeeffekte und tatschliche Volumina*. Universitts-Verlag (Wiesbaden).

Seifert, U. and R. Stehle (2003). Stock performance around share repurchase announcements in germany. *unpublished working paper (Humboldt University Berlin)*.

Stephens, C. and M. Weisbach (1998). Actual share reaquisitions in open market repurchase programs. *The Journal of Finance 53*, 313–333.

Vermaelen, T. (1981). Common stock repurchases and market signaling. *Journal of Financial Economics 9*, 139–183.

Von Eije, H. and W. Megginson (2008). Dividends and share repurchases in the european union. *Journal of Financial Economics 89*, 347–374.

Figure 1: Cumulative Average Abnormal Returns

Figure 1 depicts the cumulative average abnormal return for open market repurchase announcements over the 41 day period (-20; 20). Abnormal returns are calculated applying the market model. The market index is the CDAX performance index. The estimation period ranges from $\tau = -181$ to $\tau = -21$. Abnormal trading volume is calculated as described in Brav and Gompers (2003).

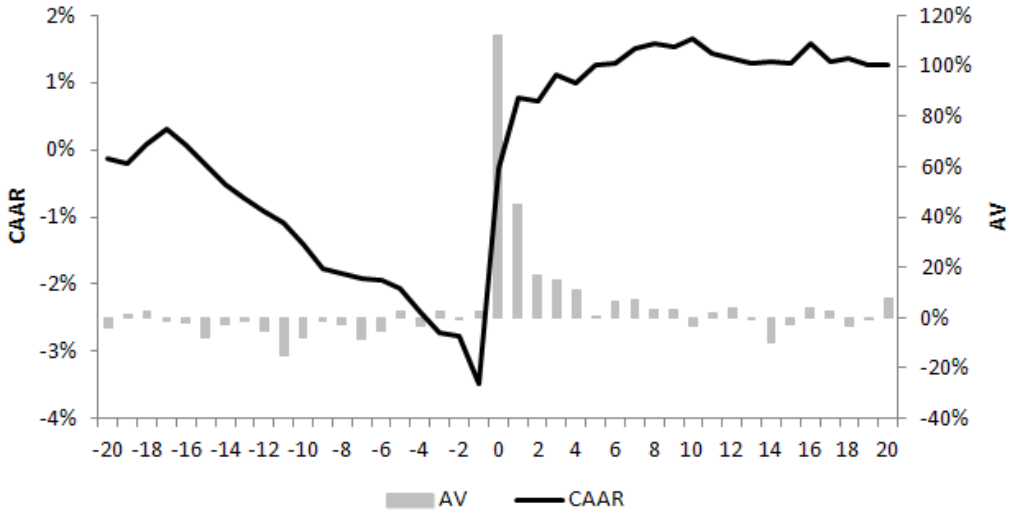

Table 1: Summary of Hypotheses

Table 1 provides an overview of the main hypotheses on share repurchases, the variables which proxy for them, and the expected signs of the related coefficients of the first-stage probit model and the second-stage cross-sectional regression.

Hypothesis	**Variable**	**Expected sign**	
		Probit	Cross-section
Signalling	Tobin's q / Market-to-book ratio	-	-
	Share price performance	-	-
	Size of repurchase program		+
	Managerial ownership x Share price performance		-
	Firm size	-	-
Free cash flow	Free cash flow	+	+
	Free cash flow x Reason 'acquisition'		-
	Cash holdings	+	+
	Tobin's q / Market-to-book ratio	-	-
	Cash holdings x Low market-to-book ratio	+	+
	Ownership concentration	+	
	Cash holdings x ownership concentr.	+	
	Leverage	-	-
Rent extraction	Stake of largest shareholder	-	+
	Stake of second largest shareholder	+	-
	Cash-flow-to-voting-rights ratio	+	-
Choice of payout method	2001 Tax reform dummy	+	
	Dividend yield	+	
	Volatility of cash flows	+	
	Volatility of dividends	-	
Capital structure	Leverage	-	-
Earnings per share	Earnings per share	?	?

Table 2: Description of Key Variables

Table 2 provides an overview of our key variables and their definitions.

Variable	Definition
Market-to-book ratio	The market value of equity plus debt to the book value of assets of the fiscal year prior to the announcement. The calculation is based on market values 3 trading days before the announcement.
Share price performance	The share price performance is measured by individual buy-and-hold returns over the 50 day period ending 3 trading days prior to the announcement.
Firm size	The natural logarithm of the firm's total assets in the fiscal year before the repurchase announcement.
Free cash flow	The free cash flow is defined as EBIT + depreciation - taxes + delta def. taxes - minority interest - interest - dividends + extra items.
Cash holdings	The firm's cash and cash equivalents relative to the firm's total assets. All items are based on the fiscal year before the repurchase announcement.
Ownership concentration	The Herfindahl index of the firms ownership structure.
Leverage	The difference of the firms market leverage ratio and the median ratio of the corresponding industry.
Stake of largest shareholder	The voting rights of the largest ultimate owner ($> 5\%$).
Stake of second largest shareholder	The voting rights of the 2nd largest ultimate owner ($> 5\%$).
Cash-flow-to-voting-rights ratio	The cash flow to voting rights ratio is calculated for the ultimate controlling shareholder.
Managerial ownership	The cumulative voting rights of the managerial board members ($> 5\%$).
2001 Tax reform dummy	Dummy variable that obtains a value of one for announcements made after the 2001 tax reform.
Dividend yield	The firm's dividend per share divided by the share price three trading days before the announcement.
Volatility of cash flows	The standard deviation of operating cash flows over the past five years.
Volatility of dividends	The standard deviation of cash dividends over the past five years.
Earnings per share	The firm's earnings per share on a diluted (adjusted) basis.

Table 3: Summary Statistics for Event and Non-event firms

Table 3 provides summary statics for the main characteristics of all event and non-event firms. Each sample consists of 438 observations. Tests of difference give the test statistics for the T-test and Wilcoxon rank test.

	Event firms		**Non-event firms**		**Tests of difference**	
	Mean	Median	Mean	Median	T-test	Wilcoxon
Mrket-to-book ratio	2.13	1.49	2.67	1.70	2.34**	2.48**
Share price performance	−0.07	−0.04	−0.04	−0.02	1.25	1.39
Firm size	12.33	12.00	12.47	11.83	0.95	−0.48
Free cash flow	0.05	0.05	0.02	0.04	−2.10**	−2.95***
Leverage	0.00	−0.02	0.05	0.02	3.53***	2.60***
Stake of largest shareholder	0.36	0.33	0.40	0.37	2.71***	2.38**
Dividend Yield	2.24	1.39	2.65	1.30	1.01	0.10

*** significant at 1%; ** significant at 5%;* significant at 10%

Table 4: Selection Equation (First-Stage Regressions)

Table 4 contains the regression result of the determinants of the decision to repurchase. Results are reported for the probit model and the joint maximum likelihood estimation (ML). In addition to our key analyses variables we employ industry (based on the ICB classifications) and year dummies. T-statistics are based on cluster-robust standard errors.

	Probit	**ML**
Market-to-book ratio	−0.0384***	−0.0426***
Share price performance	−0.1015	−0.1575
Firm size	0.0259	0.0287
Free cash flow	0.7671**	0.5946***
Cash holdings	0.2020	0.4638
High Cash holdings x Low market-to-book ratio	0.2974**	0.2565***
Ownership concentration	−0.1606	−0.0145
Cash holdings x ownership concentr.	−0.0464	−0.0097
Leverage	−0.6890***	−0.6975***
Stake of largest shareholder	−0.2727	−0.2751
Stake of second largest shareholder	0.1212	0.4065
Cash-flow-to-voting-rights ratio	0.8487*	0.8232**
2001 Tax reform dummy	−0.0654	−0.1101
Dividend yield	−0.0044	−0.00462
Volatility of cash flows	−0.0778	0.0019
Volatility of dividends	0.0028	−0.0081
Earnings per share	−0.0046	−0.0047
Nemax	0.2838*	0.3213**
Constant	−0.1015	−0.0583
#Obs.	876	876

*** significant at 1%; ** significant at 5%;* significant at 10%

Table 5: Expected and Actual Results (Selection Equation)

Table 5 shows the competing hypotheses, the independent variables which proxy for them, their expected sign and the actual results for the first-stage regression. An actual result that is conform to its prediction is denoted by a '✓'. A deviation from the prediction is denoted by an 'X'. Statistically insignificant parameters are denoted by a '0'.

Hypothesis	**Variable**	**Expected sign**	**Probit**	**ML**
Signalling	Tobin's q / Market-to-book ratio	-	✓	✓
	Share price performance	-	0	0
	Firm size	-	0	0
Free cash flow	Free cash flow	+	✓	✓
	Cash holdings	+	0	0
	Tobin's q / Market-to-book ratio	-	✓	✓
	Cash holdings x Low market-to-book ratio	+	✓	✓
	Ownership concentration	+	0	0
	Cash holdings x ownership concentr.	+	0	0
	Leverage	-	✓	✓
Rent extraction	Stake of largest shareholder	-	0	0
	Stake of second largest shareholder	+	0	0
	Cash-flow-to-voting-rights ratio	+	0	✓
Choice of payout method	2001 Tax reform dummy	+	0	0
	Dividend yield	+	0	0
	Volatility of cash flows	+	0	0
	Volatility of dividends	-	0	0
Capital structure	Leverage	-	✓	✓
Earnings per share	Earnings per share	?	0	0

Table 6: Cumulative Average Abnormal Returns

Table 6 presents the average abnormal returns (AAR) on the announcement date and the cumulative average abnormal return (CAAR) for different periods. Panel A contains the CAARs of different pre announcement periods, Panel B focuses on periods centered on the announcement day, and Panel C reports results for the post announcement period. Abnormal returns are calculated applying the market model. The market index is the CDAX performance index. The estimation period ranges from $\tau = -181$ to $\tau = -21$.

(τ, τ)	**CAAR**	**pos:neg**	**t-test**	**Patell Z**	**BMP**	**Corrado**	**Gen. Sign**
Panel A:Pre Announcement Windows							
(-20;-3)	−2.73%	168:270	-3.78^{***}	-5.52^{***}	-4.61^{***}	-2.75^{***}	-3.90^{***}
(-10;-3)	−1.64%	177:261	-3.49^{***}	-4.52^{***}	-3.83^{***}	-2.26^{***}	-3.04^{***}
Panel B: Announcement Windows							
(-2;2)	3.45%	293:145	8.42^{***}	10.62^{***}	8.12^{***}	4.81^{***}	8.06^{***}
(-1;1)	3.55%	317:121	9.42^{***}	14.93^{***}	11.14^{***}	6.74^{***}	10.26^{***}
(0;0)	3.21%	341:097	12.52^{***}	22.53^{***}	12.86^{***}	10.24^{***}	12.65^{***}
Panel C: Post Announcement Windows							
(3;10)	0.92%	225:213	2.13^{**}	2.14^{**}	2.15^{**}	1.54	1.55
(3;20)	0.55%	223:215	0.94	0.80	0.86	1.22	1.36

*** significant at 1%; ** significant at 5%;* significant at 10%

Table 7: Abnormal Return Equation (Second-Stage Regressions)

Table 7 presents the results on the determinants of abnormal returns for repurchase announcements. Abnormal returns are calculated for the single announcement day. In addition to our key analyses variables we consider the reasons stated by repurchasing firms within their ad-hoc messages. Moreover, we employ industry (based on the ICB classifications) and year dummies. T-statistics are based on cluster-robust standard errors.

	LS	**Heckmann**	**ML**
Reason 'underperformance'	0.0097	0.0094	0.0089
Reason 'excess cash'	0.0172	0.0173*	0.0175*
Reason 'capital structure'	−0.0066	−0.0067	−0.0062
Reason 'acquisition'	0.0143***	0.0142***	0.0144***
Reason 'stock option program'	−0.0007	−0.0003	−0.0007
Market-to-book ratio	−0.0003	−0.0003	0.0005
Share price performance	−0.0217**	−0.0199*	−0.0204**
Managerial ownership	−0.0161	−0.0159*	−0.0181**
Managerial ownership x Share price performance	−0.3193	−0.0323*	−0.0333**
Firm size	−0.0016	−0.0020	−0.0019
Free cash flow	0.0297	0.0211	0.0180
Free cash flow x Reason 'acquisition'	−0.1221***	−0.1233***	−0.1189***
Cash holdings	0.0146	0.0081	0.0083
High Cash holdings x Low market-to-book ratio	0.0001	0.0040	0.0078
Leverage	0.0064	0.0190	0.0036
Stake of largest shareholder	0.0207	0.0272	0.0283**
Stake of second largest shareholder	0.0286	0.0207	0.0214
Cash-flow-to-voting-rights ratio	0.0214	0.0244	0.0145
Earnings per share	−0.0018*	−0.0017*	−0.0017
Nemax	0.0277***	0.0222**	0.0223***
Constant	0.0155	0.0014	0.0343
Mill's ratio	–	0.0281***	–
Standard error σ	–	–	0.0506***
Correlation ρ	–	–	0.5623***
#Obs.	438	438	876

*** significant at 1%; ** significant at 5%;* significant at 10%

Table 8: Expected and Actual Results (Abnormal Return Equation)

Table 8 shows the competing hypotheses, the independent variables which proxy for them, their expected sign and the actual results for the second-stage regression. An actual result that is conform to its prediction is denoted by a '✓'. A deviation from the prediction is denoted by an 'X'. Statistically insignificant parameters are denoted by a '0'.

Hypothesis	**Variable**	**Expected sign**	**LS**	**Heckman**	**ML**
Signalling	Tobin's q / Market-to-book ratio	-	0	0	0
	Share price performance	-	✓	0	✓
	Managerial ownership x Share price performance	-	0	0	✓
	Firm size	-	0	0	0
Free cash flow	Free cash flow	+	0	0	0
	Free cash flow x Reason 'acquisition'	-	✓	✓	✓
	Cash holdings	+	0	0	0
	Tobin's q / Market-to-book ratio	-	0	0	0
	Cash holdings x Low market-to-book ratio	+	0	0	0
	Leverage	-	0	0	0
Rent extraction	Stake of largest shareholder	+	0	0	✓
	Stake of second largest shareholder	-	0	0	0
	Cash-flow-to-voting-rights ratio	-	0	0	0
Capital structure	Leverage	-	0	0	0
Earnings per share	Earnings per share	?	0	0	0

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