Internet Appendix

The Effect of Unsuccessful Past Repurchases on Future Repurchasing Decisions

The first section of the Internet Appendix provides detailed descriptions of control variables used in our analysis and a discussion of how our coefficient estimates for these variables relate to prior studies in the literature. The second section presents results from various robustness analyses.

IA.1 Control variables

A large prior literature identifies various determinants influencing repurchasing decisions including the motive to acquire undervalued shares, agency cost mitigation, deviations from optimal capital structure, and financial flexibility. In this section of the Internet Appendix, we discuss the background literature on these determinants and our control variables.

1.1. Firm undervaluation

Dann (1981) and Vermaelen (1981) identify undervaluation as an important motivation for repurchases. Other studies suggest that firms repurchase equity to signal undervaluation and engage in market timing (Ikenberry, Lakonishok and Vermaelen, 1995). Recent empirical work by Dittmar and Field (2015) indicates that managers do seem to exhibit positive timing ability in their repurchase decisions. Lee, Mikkelson and Partch (1992) find that managers adjust their personal trading behavior as though they had private information about their firm prior to tendering repurchase offers. Babenko, Tserlukevich and Vedrashko (2012) find that executives who buy back shares before an announcement add credibility to the undervaluation signal. They also find that program completion rates of such programs increase with insider purchases. Overall, these studies suggest undervaluation is a strong determinant of future repurchases.

To control for the undervaluation motive, we use past and future quarterly returns RET_{t-1} and RET_{t+1}, book-to-market ratio BM_{t-1} and short interest $SHORT\_INT_{t-1}$. RET_{t-1} and RET_{t+1} are based on monthly returns from CRSP. Consistent with Dittmar and Field (2015), we expect that well-timed repurchases are likely to occur following poor past returns and prior to strong future returns, implying negative and positive loadings on RET_{t-1} and RET_{t+1} respectively. BM_{t-1} is computed as a one-quarter lagged ratio of total common and ordinary equity (CEQQ) scaled by the market value of equity. Dittmar (2000) argues that because historical returns are a backward-looking measure of valuation and may not detect current misvaluation, a firm's book-to-market ratio may be a more suitable proxy for firm undervaluation. Thus we expect a positive relationship between BM_{t-1} and the decision to repurchase.

Following Rapach, Ringgenberg, and Zhou (2016) we compute a short interest index (*SHORT_INT*) in three steps. For every month, raw short interest from COMPUSTAT is scaled by each firm's number of shares outstanding from CRSP. Next, at the firm level, we compute the monthly average for each quarter and take the natural log (LN_SI), resulting in quarterly firm observations. The short interest index (*SHORT_INT*) is the de-trended measure of standardized residuals, u_t, (with a standard deviation of one and a mean of zero) of the time series regression $LN\_SI = a + bT + u_t$ estimated for each firm.

We also control for stock return volatility (VOL_{t-1}) in all of our regressions to account for managerial reluctance to buyback stock as price becomes more uncertain. VOL_{t-1} is measured as is the standard deviation of monthly stock returns calculated over the past quarter. We expect VOL_{t-1} to be negatively related to the decision to repurchase shares.

In addition, it is possible that repurchase success may correlate positively with contemporaneous stock returns during the measurement period, and failure to control for

contemporaneous returns could introduce an omitted variable bias into our results. Thus, we also include contemporaneous returns among our control variables, measured as the average return for the 3-, 5- or 10-year horizons over which the past repurchase losses are measured. These variables are denoted *RET3, RET5* and *RET10*, respectively.

1.2. Agency cost mitigation

Like dividends, repurchases can be used to alleviate agency problems associated with excess cash flow. Dittmar (2000) finds a positive and statistically significant relationship between cash, cash flow, and the level of stock repurchases. Lie (2000) shows that dividend increases are used to disgorge permanent increases in cash flows, while special dividends and tender offers are used to disgorge temporary increases. Similarly, Guay and Harford (2000) show that repurchases are used to pay out temporary cash flows. Finally, Babenko, Tserlukevich and Vedrashko (2012) find that cash and cash flows are positively and significantly related to completion rates and the level of open market share repurchases.

To control for the firm's use of repurchases to mitigate the agency cost of free cash flows, we follow Dittmar (2000) and use the firm's cash amount ($CASH_{t-1}$) and cash flow (CF_{t-1}) as controls. $CASH_{t-1}$ is measured as a one-quarter lagged ratio of cash and short-term investments (CHEQ) to the book value of assets (ATQ). CF_{t-1} is measured as a one-quarter lagged ratio of operating income before depreciation (OIBDPQ) to the book value of assets (ATQ). We follow Guay and Harford (2000) and define temporary cash flow ($TEMP\_CF_{t-1}$) as the difference between the average operating cash flows during the next three years (t=1, t=2 and t=3) and average operating cash flows during the prior three-year period (t= -4, t=-3 and t=-2) surrounding the current period (t=-1 and t=0). We expect $CASH_{t-1}$, CF_{t-1} and $TEMP\_CF_{t-1}$ to be positively related to the decision to repurchase shares.

Repurchasing decision might also be affected by internal or external monitors (i.e. institutional investors or independent board members) who are incentivized to reduce agency costs. To eliminate the confounding effects of these factors, we consider institutional ownership ($INST\_OWN_{t-1}$), board independence ($INDEP\_BOARD_{t-1}$) and ex-ante probability of being a takeover target ($PROB\_TAKEOVER_{t-1}$). $INSTOWN_{t-1}$ is the one-quarter lagged number of institutional investors in the shareholder base. $INDEP\_BOARD_{t-1}$ is the one-quarter lagged proportion of independent directors in the board. $PROB\_TAKEOVER_{t-1}$ is the ex-ante probability of the firm being a takeover target as a function of firm characteristics based on Billet and Xue (2007).

1.3. Adjustment towards optimal capital structure and financial flexibility

Stock repurchases increase firms' leverage ratios, ceteris paribus. To the extent that firms pursue an optimal capital structure, firms may use stock repurchases to achieve their target. Dittmar (2000) argues that if a firm's net leverage ratio is below its target, then it may repurchase stock to increase leverage. To control for this motive, we use the firm's one-quarter lagged leverage, LEV_{t-1}, measured as total liabilities (LTQ) scaled by the book value of assets (ATQ). We expect a negative relation between leverage and the decision to repurchase stock.

We also control for the firm size, $SIZE_{t-1}$, which is measured as the natural logarithm of the firm's book value of assets lagged by one quarter. Although prior research provides mixed predictions on how firm size should be related to repurchases, the brunt of empirical evidence suggests that size is positively related to occurrence of repurchases.[1] A positive relation is consistent with the view that larger firms tend to be less financially constrained and therefore

[1] Vermaelen (1981) holds that information asymmetry may be more pronounced in small firms because they are less covered by analysts and the popular press, and finds that smaller firms tend to have larger announcement returns. Dittmar (2000) hypothesizes a negative relationship between the natural log of assets and the level of repurchases but finds the opposite.

liquidity is unlikely to be a binding constraint for repurchases (Farrell, Unlu and Yu, 2014). For robustness, we also include the Haldock and Pierce (2010) financing constraints index (SA_INDEX_{t-1}) used in Farrell, Unlu and Yu (2014). SA_INDEX_{t-1} is the one-quarter lagged financing constraint index based on the firm size, age and age-squared.

For the repurchase-for-dividend substitution analysis, we use the control variables from Grullon and Michaely (2002) to control for the potential impact of certain firm characteristics on repurchase-for-dividend substitution. These variables are the natural logarithm of market capitalization (LOG_MV_t), return on assets (ROA_t), standard deviation of ROA_t ($SIGMA\_ROA_t$), non-operating income ($NOPER_t$), and book leverage based on interest-bearing debt ($DEBT_t$).

1.4. Discussion of Sample Statistics and Relation to Existing Studies

In the Compustat-CRSP sample (Panel A) the unconditional probability of repurchases is 26.8%. The median cash amount and cash flow are 7.88 and 3.2% of the firm's assets while median book leverage is 49.3%. The median book-to-market is 51%. Turning to the repurchase performance measures (*REPO_RET3*, *REPO_RET5* and *REPO_RET10*), we find that mean (median) cumulative return on past repurchases is 0.5% (0%), 1.6% (0%), and 6.0% (0.4%) for measurement horizons of three, five, and ten years respectively. About 30% of the repurchases have negative cumulative performance depending on the evaluation horizon: the sample means for *LOSS3*, *LOSS5* and *LOSS10* are 29%, 31.6%, and 34%, respectively. Regarding the industry composition, manufacturing firms (1-digit SIC code of 2 and 3) appear to have the largest representation whereas agricultural firms (1-digit SIC = 1) and public administration services industries (1-digit SIC =9) have the smallest presence.

Panel B of Table 2 reports the summary statistics for the Execucomp sample. The main difference between the Execucomp and Compustat-CRSP sample is the composition. Execucomp

is based on the S&P1500 which combines S&P500 (large firms), S&P MidCap 400 and S&P SmallCap 600 firms and has a higher proportion of large firms relative to the universe of all publicly traded firms, as captured by Compustat-CRSP sample. Nonetheless, we do not find much difference in terms of summary statistics and industry composition between the two samples. The number of observations across rows is not constant because we report the summary statistics at the empirical distribution for each variable. The medians for cash, cash-flow, leverage, and book-to-market are 8.0%, 3.6%, 51.9%, and 41.8% and compare closely to those reported for the Compustat-CRSP sample. Similar to the Compustat-CRSP sample, we find that mean (median) past repurchase performance is 1.1% (0%), 2.5% (0.1%), and 6.8% (0.7%) for measurement horizons of three, five, and ten years respectively. The typical CEO in our sample is 56 years old and has a tenure of 26 quarters. These characteristics closely match those reported in the executive compensation studies (Coles, Daniel and Naveen, 2006).

Panel C of Table 2 reports the summary statistics of the repurchase-for-dividend substitution sample based on Grullon and Michaely (2002). Inclusion in this sample requires the firm to pay regular dividends and therefore biases the sample towards large firms. Consistently, the average for *LOG_MV* is 7.442, implying a market capitalization of $1.7 billion. Repurchases are quite common in this sample, as 65.4% of the observations are associated with some repurchase activity with an average repurchase yield of 1.9%. The mean (median) for *REPO_RET3*, *REPO_RET5* and *REPO_RET10* are 0.5% (0%), 1.0% (0.1%), and 3.6% (1.4%) respectively. Like the other two samples, manufacturing firms appear to have the highest representation in the repurchase-for-dividend sample. To be consistent with Grullon and Michaely (2002), we include regulated firms in this sample. Our findings remain virtually the same when we exclude regulated industries.

IA.2 Robustness Analysis

This section presents additional empirical robustness tests. The first subsection analyzes our results with the inclusion of additional control variables; the second subsection repeats our analysis on sub-samples restricted to the Dot-Com Bust (4Q 2000 through 4Q 2001) and the Financial Crisis of 2008-2009; the third subsample repeats our analysis on a subsample from 2004-2015 using SEC data on both the number of shares repurchased each month and the average price paid for repurchased shares (2004 was the first year firms were required by the SEC to report this data).

IA.2.1 Robustness Tests Using Additional Control Variables

In Table IA.1, we re-estimate the logit model from Table 4 with additional control variables for institutional ownership, board independence, takeover probability, financing constraints, and temporary cash flows. Columns 1-3 use year- and CEO- fixed-effects while columns 4-6 use year- and firm- fixed-effects. The results in Table IA.1 are similar to those of Table 4, regardless of the fixed-effects estimator used.

In Figure IA.1, which uses the Execucomp sample with firm- and year- fixed-effects, we see a similar pattern to Figure 1 in the paper. A 1.5 standard deviation increase in losses predicts a reduction in repurchase probability from 45% to 30% based on the unconstrained model and from 37% to 23% based on the constrained model. As with the previous findings, we do not find any economically meaningful change in repurchase probability when past repurchases have gains.

IA.2.2 Robustness Tests Using Evidence from the Dot-Com Bust and Financial Crisis

One of our key findings in the paper is that past outcomes are strong determinants of future repurchases, even when the firm is, at least *ex post*, undervalued. In this section, we further explore

this issue in the context of two large market declines. Specifically, this section looks at the impact of past repurchase losses during the Dot-Com bust of 2000-2001 and the Financial Crisis of 2008-09. Results are reported in Tables IA.2 and IA.3.

Table IA.2 looks at the Dot-Com bust using stock data from the fourth quarter of 2000 through the last quarter of 2001, while Table IA.3 looks at the Financial Crisis using data from the first quarter of 2008 through the end of the first quarter of 2009. The impact of past losses on future repurchases is economically and statistically significant, two to three times larger in magnitude than the full-sample estimates reported in Table 3, and strongest when past losses are measured over relatively shorter horizons (for example, the magnitude of the interaction term in Table IA.2 at the three-year horizon is 11.2215 while at a ten-year horizon is 1.9873; in Table IA.3, the corresponding values are 7.5681 and 1.5970). This suggests that during these crisis periods, CEOs exhibited a heightened focus on recent poor performance when making future repurchase decisions.

IA.2.2 Robustness Test Using Post-2003 Repurchase Data

Since 2003, firms have been required to report to the SEC both the number of shares repurchased each month and the average price paid for repurchased shares. Using this data from 2004-2015, we re-estimate our basic model and report the results in Table IA.4. The results are, if anything, more striking that those reported in Table 3. When we use a three-year window to measure past gains and losses, the coefficient on past returns (*REPO_RET3)* is 2.1355, while the coefficient on the interaction term of past returns and losses (*REPO_RET3 x LOSS3)* is 3.0513. For five- and ten-year measurement periods, the results are even more striking: when measured over five years, prior gains have less impact on future repurchases (*REPO_RET5* = 1.1005) although the impact of past losses is still large (*REPO_RET5 x LOSS5* = 5.1847*)*; over ten years,

the impact of losses is an order of magnitude larger than the impact of gains repurchases (*REPO_RET10* = -0.1905 and *REPO_RET10 x LOSS10* = 3.0392*).*

References

Babenko, I., Tserlukevich, Y. and Vedrashko, A., 2012. The credibility of open market share repurchase signaling. *Journal of Financial and Quantitative Analysis*, pp.1059-1088.

Billett, M.T. and Xue, H., 2007. The takeover deterrent effect of open market share repurchases. *The Journal of Finance*, *62*(4), pp.1827-1850.

Coles, J.L., Daniel, N.D. and Naveen, L., 2006. Managerial incentives and risk-taking. *Journal of Financial Economics*, *79*(2), pp.431-468.

Dann, L.Y., 1981. Common stock repurchases: An analysis of returns to bondholders and stockholders. *Journal of Financial Economics*, *9*(2), pp.113-138.

Dittmar, A.K., 2000. Why Do Firms Repurchase Stock? *The Journal of Business*, *73*(3), pp.331-355.

Dittmar, A. and Field, L.C., 2015. Can managers time the market? Evidence using repurchase price data. *Journal of Financial Economics*, *115*(2), pp.261-282.

Farrell, K., Unlu, E. and Yu, J., 2014. Stock repurchases as an earnings management mechanism: The impact of financing constraints. *Journal of Corporate Finance*, *25*, pp.1-15.

Grullon, G. and Michaely, R., 2002. Dividends, share repurchases, and the substitution hypothesis. *The Journal of Finance*, *57*(4), pp.1649-1684.

Guay, W. and Harford, J., 2000. The cash-flow permanence and information content of dividend increases versus repurchases. *Journal of Financial Economics*, *57*(3), pp.385-415.

Ikenberry, D., Lakonishok, J. and Vermaelen, T., 1995. Market underreaction to open market share repurchases. *Journal of Financial Economics*, *39*(2), pp.181-208.

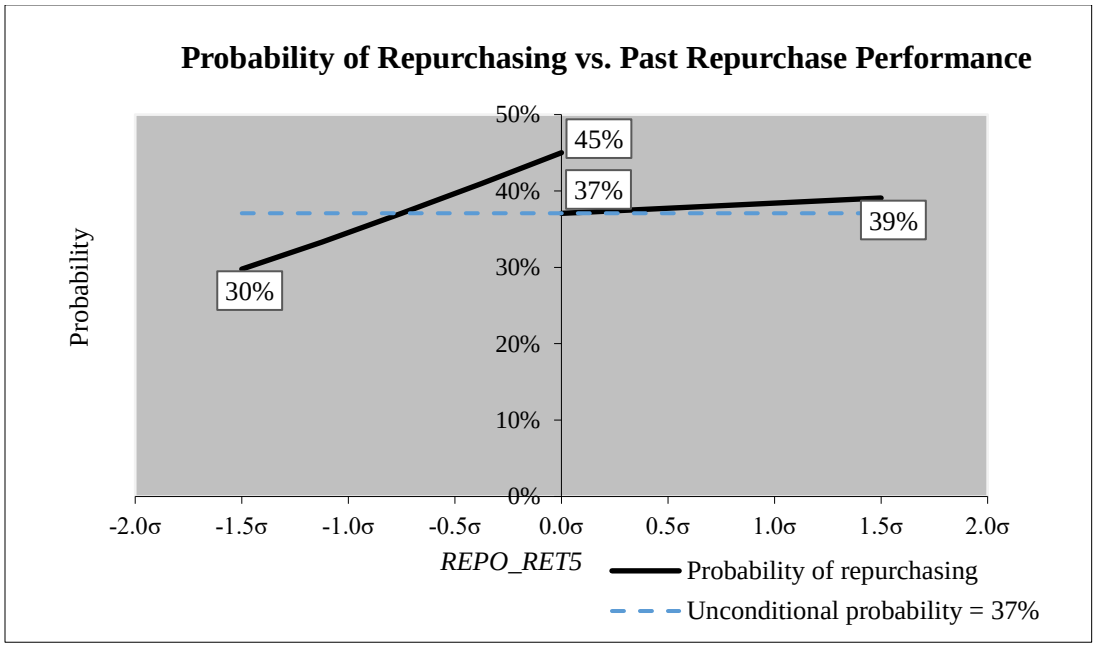
Lee, D.S., Mikkelson, W.H. and Partch, M.M., 1992. Managers' trading around stock repurchases. *The Journal of Finance*, *47*(5), pp.1947-1961.

Lie, E., 2000. Excess funds and agency problems: An empirical study of incremental cash disbursements. *The Review of Financial Studies*, *13*(1), pp.219-248.

Rapach, D.E., Ringgenberg, M.C. and Zhou, G., 2016. Short interest and aggregate stock returns. *Journal of Financial Economics*, *121*(1), pp.46-65.

Vermaelen, T., 1981. Common stock repurchases and market signalling: An empirical study. *Journal of Financial Economics*, *9*(2), pp.139-183.

Figure IA.1
Evaluation of economic significance
Execucomp sample with firm/year effects
These figures show the predicted in-sample probabilities of repurchasing for varying levels of *REPO_RET5* based on logistic estimation results. *REPO_RET5* is varied 1.5 standard deviations around 0%. All other variables are evaluated at the sample median shown in Panel B of Table 2. Firm and year effects are evaluated so that the predicted probability of repurchasing equals to unconditional probability of 37%. The top figure is based on the unconstrained model (Model 5 of Table 4) and the bottom figure is based the constrained model where the coefficient of *LOSS5* is set to zero to eliminate the discontinuity on the y-axis.



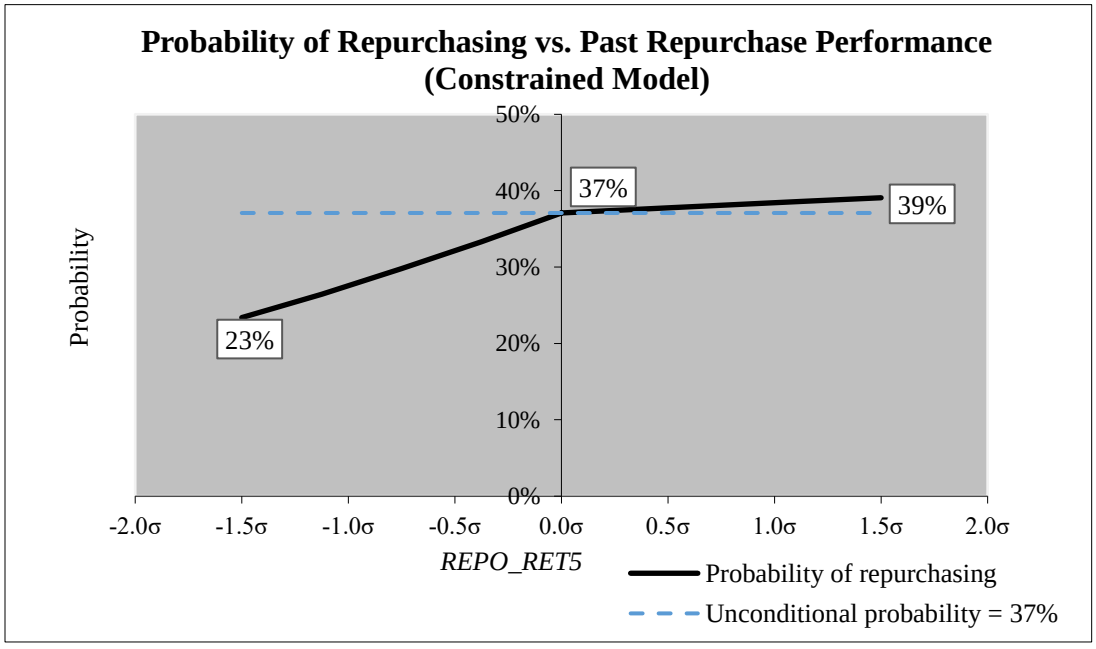


Table IA.1
The impact of past repurchase returns on the decision to repurchase new shares
CEO fixed effects

This table presents CEO fixed effects logit regressions of quarterly stock repurchase activity from 1993-2016 using the Execucomp sample. Data presented in this table is based on extended specifications with additional control variables with substantially smaller sample sizes. The dependent variable is $REPODUM_t$ that equals one when the firm buys back stock during the quarter and zero otherwise. $REPODUM_t$ is a dummy variable that equals one when the firm buys back stock during the quarter and zero otherwise. $CASH_{t-1}$ is one-quarter lagged cash and short-term investments scaled by total assets (Compustat: CHEQ/ ATQ). CF_{t-1} is one-quarter lagged operating income before depreciation scaled by total assets (Compustat: OIBDPQ / ATQ). BM_{t-1} is one-quarter lagged book-to-market ratio. Book value is defined as total common or ordinary equity (Compustat: CEQQ) and the market value is defined as last trading day of the quarter shares outstanding (CRSP: SHROUT) multiplied by the closing price (CRSP: PRC). RET_{t-1} (RET_{t+1}) is the cumulative stock return for the past (next) quarter based on the monthly returns from CRSP. LEV_{t-1} is one-quarter lagged total liabilities scaled by total assets (Compustat: LTQ/ATQ). $SIZE_{t-1}$ is the natural log of total assets (Compustat: ATQ). VOL_{t-1} is the standard deviation of monthly stock returns calculated over the past quarter. During the tenure of the same CEO, *RET3_CEO, RET5_CEO, RET10_CEO* are cumulative return on the firm's equity during the past 3, 5 and 10 years respectively. *REPO_RET3_CEO, REPO_RET5_CEO,* and *REPO_RET10_CEO* are the cumulative values of all stocks a firm has repurchased minus the dollars spent on those repurchases (reference point) scaled by total assets during the CEO's tenure using a 3-year, 5-year and 10-year rolling window respectively. *LOSS3_CEO, LOSS5_CEO* and *LOSS10_CEO* are dummy variables that equal one when *REPO_RET3_CEO, REPO_RET5_CEO* and *REPO_RET10_CEO* are negative respectively and zero otherwise. $INSTOWN_{t-1}$ is the one-quarter lagged number of institutional investors in the shareholder base. $INDEP\_BOARD_{t-1}$ is the one-quarter lagged proportion of independent directors in the board. $PROB\_TAKEOVER_{t-1}$ is the ex-ante probability of the firm being a takeover target as a function of firm characteristics based on Billet and Xue (2007). SA_INDEX_{t-1} is the one-quarter lagged financing constraint index based on the firm size, age and age-squared from Hadlock and Pierce (2010). $TEMP\_CF_{t-1}$ is the one-quarter lagged temporary cash flow of the firm based on Guay and Harford (2000). Variables are winsorized at 1% on each tail. ***, ** and * denote statistical significance at 1%, 5% and 10% respectively.

Additional control variables

Hypotheses	Variables	[1]	[2]	[3]	[4]	[5]	[6]
Agency	$CASH_{t-1}$ (+)	1.2690***	1.2749***	1.5246***	0.8994***	0.9423***	1.3412***
	CF_{t-1} (+)	4.8642***	5.3337***	7.7663***	6.3004***	6.479***	7.8754***
Monitoring	$INSTOWN_{t-1}$ (+)	0.0018***	0.0020***	0.0018***	0.0011***	0.0010***	0.0018***
	$INDEP\_BOARD_{t-1}$ (+)	0.7168***	0.7551***	0.9290***	1.0043***	1.0579***	0.9931***
Takeover defense	$PROB\_TAKEOVER_{t-1}$ (+)	0.6255**	0.5412*	0.4752	0.3467	0.1211	0.3524
Financial constraints	SA_INDEX_{t-1} (-)	-0.8448***	-1.0192***	-1.1411***	-0.7847***	-0.6332***	-0.9874***
Temporary cash flows	$TEMP\_CF_{t-1}$ (+)	0.3554	0.2017	0.0271	1.2933	1.0834	0.9088
Undervaluation	BM_{t-1} (+)	-0.3158***	-0.1923**	-0.0842	-0.4835***	-0.3615***	-0.1301
	RET_{t-1} (-)	-0.5633***	-0.5644***	-0.6088***	-0.5405***	-0.5598***	-0.6178***
	RET_{t+1} (+)	0.2894***	0.2857***	0.2296**	0.3064***	0.2903***	0.245**
Leverage	LEV_{t-1} (-)	-3.2052***	-2.914***	-2.4789***	-2.9368***	-2.7362***	-2.2749***
	$SIZE_{t-1}$ (?)	-0.3518***	-0.5034***	-0.5678***	-0.1710**	-0.1834**	-0.5618***
Return volatility	VOL_{t-1} (-)	-1.1019***	-1.1374***	-1.2897***	-1.3636***	-1.3719***	-1.3572***
Past performance	*RET3_CEO*	-0.0071			-0.0268		
	REPO_RET3_CEO	0.8835**			2.7239***		
	LOSS3 _CEO	0.2851***			0.3364***		
	REPO_RET3_CEO xLOSS3_CEO	3.8989***			2.5048*		
	RET5_CEO		0.0112			-0.0080	
	REPO_RET5_CEO		-0.8324***			0.1988	
	LOSS5_CEO		0.1782***			0.1895***	
	REPO_RET5_CEO xLOSS5_CEO		5.5517***			3.4352***	
	RET10_CEO			-0.0133			-0.00348
	REPO_RET10_CEO			-0.8504***			-0.6928***
	LOSS10_CEO			0.0473			0.0587
	REPO_RET10_CEO xLOSS10_CEO			3.7330***			3.3099***
Year effects		Included	Included	Included	Included	Included	Included
CEO effects		Included	Included	Included	Excluded	Excluded	Excluded
Firm effects		Excluded	Excluded	Excluded	Included	Included	Included
Pseudo-R^2		0.050	0.052	0.057	0.058	0.056	0.057
N		40,073	35,335	20,115	40,073	35,335	20,115
# $REPO\_DUM_t$=1		16,667	14,677	8,302	16,667	14,677	8,302
# CEOs/Firms		1,574	1,279	554	1,039	941	508

Table IA.2
The impact of past repurchase returns on the decision to repurchase new shares
Evidence following the Dotcom bust

This table presents logit regressions on quarterly stock repurchase activity based on the last quarter of 2000 and the last quarter of 2001. The dependent variable is $REPODUM_t$ that equals one when the firm buys back stock during the quarter and zero otherwise. $CASH_{t-1}$ is one-quarter lagged cash and short-term investments scaled by total assets (Compustat: CHEQ/ ATQ). CF_{t-1} is one-quarter lagged operating income before depreciation scaled by total assets (Compustat: OIBDPQ / ATQ). BM_{t-1} is one-quarter lagged book-to-market ratio. Book value is defined as total common or ordinary equity (Compustat: CEQQ) and the market value is defined as last trading day of the quarter shares outstanding (CRSP: SHROUT) multiplied by the closing price (CRSP: PRC). RET_{t-1} (RET_{t+1}) is the cumulative stock return for the past (next) quarter based on the monthly returns from CRSP. LEV_{t-1} is one-quarter lagged total liabilities scaled by total assets (Compustat: LTQ/ATQ). $SIZE_{t-1}$ is the natural log of total assets (Compustat: ATQ). VOL_{t-1} is the standard deviation of monthly stock returns calculated over the past quarter. *RET3, RET5, RET10* are cumulative return on the firm's equity over the past 3, 5 and 10 years respectively. *REPO_RET3, REPO_RET5,* and *REPO_RET10* are the cumulative values of all stocks a firm has repurchased minus the dollars spent on those repurchases (reference point) scaled by total assets using a 3-year, 5-year and 10-year rolling window respectively. *LOSS3, LOSS5 and LOSS10* are dummy variables that equal one when *REPO_RET3, REPO_RET5* and *REPO_RET10* are negative respectively and zero otherwise. Variables are winsorized at 1% on each tail. ***, ** and * denote statistical significance at 1%, 5% and 10% respectively.

Hypotheses	Variables	Dependent variable = $REPO\_DUM_t$		
		[1]	[2]	[3]
Agency	$CASH_{t-1}$ (+)	-0.4739***	-0.6500***	-0.6764***
	CF_{t-1} (+)	6.9543***	7.7017***	7.9510***
Undervaluation	BM_{t-1} (+)	-0.2918**	-0.3149***	-0.3019***
	RET_{t-1} (-)	0.0529	-0.1049	-0.3078**
	RET_{t+1} (+)	0.2831***	0.2577**	0.2126
Leverage	LEV_{t-1} (-)	-1.774***	-1.8152***	-1.5456***
	$SIZE_{t-1}$ (+)	0.0356***	0.0549***	0.0483***
Return volatility	VOL_{t-1} (-)	-3.6689	-3.5814	-3.3714
Past performance	*RET3*	-0.1766***		
	REPO_RET3	6.7270***		
	LOSS3	0.3855***		
	REPO_RET3 x LOSS3	11.2215***		
	RET5		-0.0843***	
	REPO_RET5		3.0038***	
	LOSS5		0.2368***	
	REPO_RET5 x LOSS5		5.0763***	
	RET10			-0.0129
	REPO_RET10			0.9210***
	LOSS10			-0.0363
	REPO_RET10 x LOSS10			1.9873**
Pseudo-R^2		0.011	0.012	0.015
N		8,159	6,227	4,146
# $REPO\_DUM_t$=1		2,116	1,666	1,149
# firms		793	607	421

Table IA.3
The impact of past repurchase returns on the decision to repurchase new shares
Evidence following the Financial Crisis

This table presents logit regressions on quarterly stock repurchase activity based on the first quarter of 2008 and the first quarter of 2009. The dependent variable is $REPODUM_t$ that equals one when the firm buys back stock during the quarter and zero otherwise. $CASH_{t-1}$ is one-quarter lagged cash and short-term investments scaled by total assets (Compustat: CHEQ/ ATQ). CF_{t-1} is one-quarter lagged operating income before depreciation scaled by total assets (Compustat: OIBDPQ / ATQ). BM_{t-1} is one-quarter lagged book-to-market ratio. Book value is defined as total common or ordinary equity (Compustat: CEQQ) and the market value is defined as last trading day of the quarter shares outstanding (CRSP: SHROUT) multiplied by the closing price (CRSP: PRC). RET_{t-1} (RET_{t+1}) is the cumulative stock return for the past (next) quarter based on the monthly returns from CRSP. LEV_{t-1} is one-quarter lagged total liabilities scaled by total assets (Compustat: LTQ/ATQ). $SIZE_{t-1}$ is the natural log of total assets (Compustat: ATQ). VOL_{t-1} is the standard deviation of monthly stock returns calculated over the past quarter. *RET3*, *RET5*, *RET10* are cumulative return on the firm's equity over the past 3, 5 and 10 years respectively. *REPO_RET3*, *REPO_RET5*, and *REPO_RET10* are the cumulative values of all stocks a firm has repurchased minus the dollars spent on those repurchases (reference point) scaled by total assets using a 3-year, 5-year and 10-year rolling window respectively. *LOSS3, LOSS5 and LOSS10* are dummy variables that equal one when *REPO_RET3*, *REPO_RET5* and *REPO_RET10* are negative respectively and zero otherwise. Variables are winsorized at 1% on each tail. ***, ** and * denote statistical significance at 1%, 5% and 10% respectively.

Hypotheses	Variables	Dependent variable = $REPO\_DUM_t$		
		[1]	[2]	[3]
Agency	$CASH_{t-1}$ (+)	0.8318	0.9849	0.4224
	CF_{t-1} (+)	-2.5784	-2.8912	-2.0942
Undervaluation	BM_{t-1} (+)	-0.0526	-0.011	-0.0618
	RET_{t-1} (-)	-1.0719***	-1.0787***	-1.0442
	RET_{t+1} (+)	0.5952***	0.5570***	0.6186
Leverage	LEV_{t-1} (-)	-7.5283***	-8.2535***	-8.6437
	$SIZE_{t-1}$ (+)	1.0591***	1.2544***	1.1451**
Return volatility	VOL_{t-1} (-)	0.1845	0.5135	0.3745
Past performance	*RET3*	0.1871**		
	REPO_RET3	2.5246		
	LOSS3	-0.199*		
	REPO_RET3 x LOSS3	7.5681***		
	RET5		0.1515***	
	REPO_RET5		2.1328*	
	LOSS5		-0.2527**	
	REPO_RET5 x LOSS5		2.8283***	
	RET10			0.0339
	REPO_RET10			1.5437**
	LOSS10			-0.5629***
	REPO_RET10 x LOSS10			1.597*
Pseudo-R^2		0.025	0.027	0.024
N		8,519	7,868	5,543
# $REPO\_DUM_t$=1		2,832	2,583	1,852
# firms		981	908	659

Table IA.4
The impact of past repurchase returns on the decision to repurchase new shares
Realized share repurchases

This table presents firm fixed effects logit regressions on quarterly stock repurchase activity from 2004-2016 using realized stock repurchase amounts reported in SEC filings. The dependent variable is $REPODUM_t$ that equals one when the firm buys back stock during the quarter and zero otherwise. $CASH_{t-1}$ is one-quarter lagged cash and short-term investments scaled by total assets (Compustat: CHEQ/ ATQ). CF_{t-1} is one-quarter lagged operating income before depreciation scaled by total assets (Compustat: OIBDPQ / ATQ). BM_{t-1} is one-quarter lagged book-to-market ratio. Book value is defined as total common or ordinary equity (Compustat: CEQQ) and the market value is defined as last trading day of the quarter shares outstanding (CRSP: SHROUT) multiplied by the closing price (CRSP: PRC). RET_{t-1} (RET_{t+1}) is the cumulative stock return for the past (next) quarter based on the monthly returns from CRSP. LEV_{t-1} is one-quarter lagged total liabilities scaled by total assets (Compustat: LTQ/ATQ). $SIZE_{t-1}$ is the natural log of total assets (Compustat: ATQ). VOL_{t-1} is the standard deviation of monthly stock returns calculated over the past quarter. *REPO_RET3, REPO_RET5,* and *REPO_RET10* are the cumulative values of all stocks a firm has repurchased minus the dollars spent on those repurchases (reference point) scaled by total assets using a 3-year, 5-year and 10-year rolling window respectively. *LOSS3, LOSS5 and LOSS10* are dummy variables that equal one when *REPO_RET3*, *REPO_RET5* and *REPO_RET10* are negative respectively and zero otherwise. Variables are winsorized at 1% on each tail. ***, ** and * denote statistical significance at 1%, 5% and 10% respectively.

Hypotheses	Variables	Dependent variable = $REPO\_DUM_t$			
		[1]	[2]	[3]	[4]
Agency	$CASH_{t-1}$ (+)	1.8816***	1.6133***	1.3757***	1.8870**
	CF_{t-1} (+)	5.8761***	5.2962***	4.9554***	0.8234
Undervaluation	BM_{t-1} (+)	-0.4384***	-0.4851***	-0.332***	-0.3132
	RET_{t-1} (-)	-0.7499***	-0.7755***	-0.5927***	-1.1233***
	RET_{t+1} (+)	0.2848***	0.2326***	0.2395***	0.1824
Leverage	LEV_{t-1} (-)	-2.1976***	-2.2544***	-2.501***	-2.3201***
	$SIZE_{t-1}$ (+)	0.4847***	0.3229***	0.1763**	0.4623
Return volatility	VOL_{t-1} (-)	-1.1688***	-1.2112***	-1.3607***	1.0645
Past performance	*RET3*		0.0221		
	REPO_RET3		2.1355***		
	LOSS3		0.1632***		
	REPO_RET3 x LOSS3		3.0513***		
	RET5			-0.00765	
	REPO_RET5			1.1005***	
	LOSS5			-0.0602	
	REPO_RET5 x LOSS5			5.1847***	
	RET10				0.2229***
	REPO_RET10				-0.1905
	LOSS10				-0.3233*
	REPO_RET10 x LOSS10				3.0392**
Firm effects		Included	Included	Included	Included
Year effects		Included	Included	Included	Included
Pseudo-R^2		0.048	0.044	0.036	0.010
N		66,417	44,391	30,432	6,074
# $REPO\_DUM_t$=1		27,424	17,804	12,826	3,181
# firms		2,150	1,497	1,155	426