Financial Management

Corporate Cash Holdings and Acquisitions

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We find that acquirers' announcement returns decline with their cash holdings, but only when at least part of the payment is in the form of stock. We further find evidence that acquirers that use stock payment are overvalued, especially when they have excess cash that they could have used instead. Collectively, our results suggest that investors interpret announcements of stock acquisitions as a signal that the acquirers' equity is overvalued and that high cash holdings intensify this signal. However, our results are inconsistent with the common belief that cash holdings induce value-destroying acquisitions.

According to Moody's Investors Services, US nonfinancial companies rated by Moody's held $1.68 trillion in cash at the end of 2015, double the $815 billion amount they held in 2007. Furthermore, Harford, Klasa, and Maxwell (2014) show that average cash holdings for US firms increased steadily from about 12% in the 1980s to 14% in the 1990s and 18% in the 2000s. The magnitude of these cash hoards has attracted substantial attention from the media and activist investors alike.

Numerous studies articulate the concern that cash hoards give managers leeway to invest in negative net present value projects. Most prominently, Jensen (1986) hypothesizes that "managers of firms with unused borrowing power and large free cash flows are more likely to undertake low-benefit or even value-destroying mergers" (p. 328). While Jensen (1986) does not expressly address the level of cash holdings in his paper, it is plausible that the same argument applies to cash holdings. Harford (1999) argues that excess cash is simply the result of accumulated free cash flows and predicts that firms with excess cash tend to make value-destroying acquisitions. Consistent with this view, Harford (1999) finds evidence that firms with excess cash are more likely to undertake acquisitions and that acquisitions made by these firms are associated with lower announcement returns.

In this paper, we revisit the evidence on cash and acquisitions for three reasons. First, results from the sample period estimated in prior papers may no longer be valid. Harford (1999) examines a sample of 487 acquisitions from 1977 to 1993. Since that period, several factors might have affected the extent to which firms spend excess cash on value-destroying acquisitions. For example, the substantial accumulation in cash during recent decades along with a surge in merger and acquisition (M&A) activity that started in the mid-1990s imply an increase in value-destroying acquisitions. However, the greater scrutiny of cash hoarding and numerous corporate governance reforms (including the 2002 Sarbanes-Oxley Act, new exchange requirements on corporate board

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compositions, and new Securities and Exchange Commission requirement on compensation disclosure) constrain the ability of managers to waste excess cash on bad acquisitions.

Second, prior literature does not distinguish between cash and stock acquisitions, a distinction that we believe is important. Jensen (1986) emphasizes that the benefits of acquisitions depend on whether they are financed with stock or cash, and the main predictions of the free cash flow theory pertain to cash acquisitions. While Harford (1999) controls for the payment method in his multivariate analysis, he does not consider whether his results differ across cash and stock acquisitions. Similarly, Gao (2011) finds that the negative relation between acquirers' cash holdings and announcement returns prevails for a sample of pure stock acquisitions but does not examine the relation for cash acquisitions.

Third, we examine alternative conjectures on the effect of cash holdings on acquisitions. Specifically, we hypothesize that cash holdings do not necessarily induce more value-destroying acquisitions. Financing acquisitions with stock allows firms to overinvest even with limited or no cash holdings. Indeed, "empires" like Worldcom Inc. were built via stock-financed acquisitions. Furthermore, prima facie, several empirical results are inconsistent with excess cash holdings being spent on bad acquisitions. Moeller, Schlingemann, and Stulz (2004), Savor and Lu (2009), and others show that acquisitions financed with stock, but not those financed with cash, are associated with an average negative stock price reaction for the acquirers. Moreover, Gao (2011) and Pinkowitz, Sturgess, and Williamson (2013) find that cash-rich firms are actually *less* likely than other firms to finance their acquisitions with cash. We also consider an alternative conjecture on the effect of cash holdings on announcement returns for acquirers. Savor and Lu (2009) report evidence that overvaluation of acquirers, rather than value destruction, explains the average negative announcement returns for acquirers in stock acquisitions. In other words, the stock market interprets firms' decisions to use their stock to make acquisitions as a signal that the stock is overvalued. Gao (2011) conjectures that this signal is stronger when acquirers have cash hoards, but managers choose not to use cash as part of the payment. That would explain the negative relation between acquirers' cash holdings and announcement returns for stock acquisitions, while it has no clear bearing on the relation for cash acquisitions.

We examine a sample of 2,785 acquisitions of public targets between 1985 and 2015 to study the impact of cash holdings on acquisitions. Our sample is more than five times larger than that of Harford (1999), reflecting the more active market for M&As during the last couple of decades. About 1,000 of the transactions are paid for with only cash, 1,200 with only stock, and the rest with a mix, allowing us to run separate analyses for the three payment categories.

In our initial analysis, we examine whether excess cash induces firms to make more acquisitions. The free cash flow theory predicts that the propensity to undertake acquisitions increases with cash holdings, at least when acquisitions are financed with cash. The prediction for acquisitions financed with stock is less clear, because little or no cash is strictly needed to undertake such acquisitions. Inconsistent with the free cash flow theory, we find no evidence that cash holdings spur cash acquisitions. In fact, there is no evidence that cash holdings spur acquisition activity irrespective of payment method.

Next, we replicate what we regard as Harford's (1999) primary result, which is that the announcement returns for acquirers decline with their cash holdings. We find that the negative relation between announcement returns and cash holdings is more pronounced for our sample, both economically and statistically. On this basis, there is no evidence to suggest that Harford's (1999) results have faded over time.

However, when we run the analysis separately for the three payment categories, we find important differences. For stock acquisitions, the relation between announcement returns and cash holdings is even more negative than it is for the overall sample. Conversely, for mixed payment

and cash acquisitions, there is no statistically significant relation between announcement returns and cash holdings. The absence of a relation between announcement returns and cash holdings for cash acquisitions seems at odds with the common interpretation of Jensen's (1986) free cash flow theory and Harford's (1999) conclusion that "cash-rich firms engage in value-decreasing behavior" (p. 1971). But the negative relation between announcement returns and cash holdings for stock acquisitions is consistent with the overvaluation conjecture.

We investigate the overvaluation conjecture further using both 1) a measure for overvaluation from Fu, Leming, and Officer (2013) and 2) long-term stock returns. Consistent with Fu et al. (2013), we find that acquirers with stock payment are more overvalued than those with cash payment. More importantly for the purposes of our study, we find evidence that the overvaluation of acquirers that use stock payment increases with their cash holdings. This evidence is statistically fragile when we use the overvaluation measure from Fu et al. (2013) but quite strong for some of the long-term return estimates. If the capital market partially deciphers and corrects any overvaluation when acquisitions are announced, the value correction can explain both the lower announcement return and the negative relation between the announcement return and cash holdings for stock acquisitions.

Finally, we examine operating performance around acquisitions. We find that the improvement in operating performance increases with the acquirer's prior cash holdings. Thus, there is no evidence that high cash holdings induce worse acquisitions. We interpret this as further support that the negative relation between cash holdings and announcement returns is attributable to correction of overvaluation upon the announcements.

I. Sample

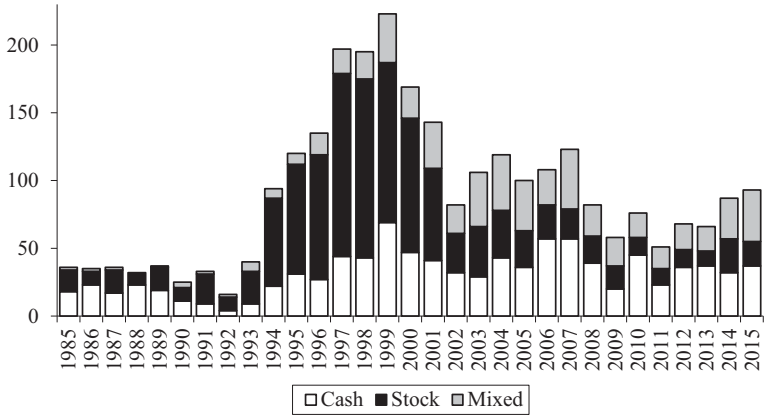
We examine acquisitions announced between January 1985 and December 2015. Our initial sample is derived from the Securities Data Company's (SDC) M&A database. We further supplement and correct the SDC information based on information from various news sources. To be in the final sample, we require that 1) the acquiring firm sought 100% of the shares of the target firm, 2) the status is known and not pending, 3) both the target and the acquiring firm are publicly traded and have available information in the Center for Research in Security Prices and Compustat databases, 4) the target shares are ordinary common shares, 5) and the payment includes only cash and/or stock. This process leads to a sample of 2,785 observations.

Figure 1 shows the distribution of the sample over time by payment method. The number of transactions remains low and steady from 1985 to 1993. Given that Harford's (1999) sample period ends in 1993, this explains his relatively small sample of 487 transactions. There is an extraordinary rise in the number of transactions starting in 1994 and continuing through the end of the century. This is followed by a sharp decline from 1999 to 2002 and another decline around the financial crises in 2008-2009. Yet, each year in the new century, even those during the financial crisis, exhibits more transactions than individual years in the late 1980s to 1993.

There are multiple reasons for the high takeover activity during the last couple of decades and for mergers to occur in waves. Mitchell and Mulherin (1996) argue that industry shocks trigger restructuring and consolidation of industries, while Shleifer and Vishny (2003), Rhodes-Kropf and Viswanathan (2004), and Rhodes-Kropf, Robinson, and Viswanathan (2005) argue that stock market overvaluation induces merger waves. In the spirit of Mitchell and Mulherin (1996), Harford (2005) argues that economic, regulatory, and technological factors spur merger waves, but only if there is sufficient capital liquidity. Following that logic, the rising cash hoards might have contributed to more takeover activity in recent decades, both because of the tendency

Figure 1. Distribution of Sample over Time by Payment Method

The figure shows the year distribution of the sample of 2,785 acquisitions announced between 1985 and 2015 by payment method.



to overinvest that might accompany excess cash and because of the conditional role that liquidity arguably plays in takeovers.

The fraction of cash deals declines gradually from the beginning of the sample period until 1997 but has steadily increased afterward. The trend for the fraction of all-stock deals is quite the contrary, increasing gradually until 1997 and decreasing thereafter. Finally, the proportion of mixed-payment deals hovers around 10% from 1985 to 2000 and increases to more than 30% of all deals during 2001-2015. On the basis of these univariate payment trends, there is scant evidence that the accumulating cash balances across the economy during our sample period have resulted in more acquisitions financed with cash.

Table I presents descriptive statistics for the acquiring and target firms in our sample by payment type. The market capitalization is measured five days before the acquisition announcement. Debt ratio is calculated as long- and short-term debt scaled by book value of assets. Cash ratio is cash and cash equivalents scaled by book value of assets. The market-to-book ratio is book value of assets minus book value of equity plus market value of equity dividend by book value of assets. The announcement return is the abnormal stock return measured from the day before through the day after the acquisition announcement using a one-factor market model, where the value-weighted index is used as a proxy for overall market returns and the estimation period spans from 250 to 10 days before the announcement. We measure the prior one-year return over the year ending five days before the acquisition announcement.

As can be seen in Table I, on average, acquirers that pay with stock have higher market-to-book ratios and higher recent stock price run-ups than other acquirers, consistent with Martin (1996), Heron and Lie (2002), Faccio and Masulis (2005), and Fu et al. (2013). Acquirers that pay with cash tend to be larger, while the targets of cash deals tend to be smaller than other targets. In short, cash is used as payment when large firms acquire small firms. The ratio of the market capitalization of targets to that of acquirers corroborates this; this ratio is, on average, 0.15 for cash acquisitions, significantly less than the average ratios of 0.28 and 0.33 for stock and mixed-payment acquisitions, respectively (not tabulated).

Table I. Descriptive Statistics

The table provides descriptive statistics for the sample of 2,785 acquisitions announced between January 1985 and December 2015. The market capitalization is estimated five days before the acquisition announcement. The book value of assets, debt ratio (long- and short-term debt scaled by book value of assets), cash ratio (cash and cash equivalents scaled by book value of assets), and market-to-book ratio are measured at the end of the fiscal year before the acquisition announcement. The announcement return is the abnormal stock return measured from the day before through the day after the acquisition announcement using a one-factor market model, where the value-weighted index is used as a proxy for overall market returns and the estimation period spans from 250 to 10 days prior to the announcement. The prior one-year stock return is measured during the year ending five days before the acquisition announcement.

	Cash Payment		**Stock Payment**		**Mixed Payment**	
	($n = 980$)		**($n = 1,229$)**		**($n = 576$)**	
	Mean	**Median**	**Mean**	**Median**	**Mean**	**Median**
			Panel A. Acquirer			
Market cap. (in million $)	20,969	3,012	10,570	1,284	8,175	1,378
Book value of assets	20,368	2,911	18,397	1,844	20,368	2,835
Debt ratio	0.208	0.186	0.189	0.158	0.220	0.183
Cash ratio	0.152	0.090	0.157	0.067	0.122	0.049
Market-to-book ratio	1.986	1.645	2.511	1.437	1.633	1.169
Announcement return	0.010*	0.005*	−0.028*	−0.024*	−0.021*	−0.021*
Prior one-year return	0.351	0.217	0.470	0.287	0.378	0.215
			Panel B. Target			
Market cap. (in million $)	616	150	1,081	144	1,512	173
Book value of assets	733	169	3,906	293	2,682	584
Debt ratio	0.187	0.110	0.186	0.128	0.196	0.146
Cash ratio	0.216	0.118	0.179	0.076	0.142	0.048
Market-to-book ratio	1.790	1.428	2.022	1.218	1.522	1.104
Announcement return	0.331*	0.272*	0.183*	0.142*	0.219*	0.187*
Prior one-year return	0.334	0.206	0.271	0.144	0.359	0.233

*Significant at the 0.10 level.

The stock price reaction to announcements of deals financed with stock or a mix of stock and cash is, on average, negative for acquirers, whereas the stock price reaction to announcements of deals financed with cash is, on average, positive for acquirers, roughly consistent with prior studies, including Moeller et al. (2004) and Savor and Lu (2009). The average stock price reaction for target firms is, as expected, very positive across the payment types, ranging from 18% for stock deals to 33% for cash deals.

II. Results

A. The Decision to Undertake Acquisitions

In our initial analysis, we examine the decision to undertake acquisitions. We are particularly interested in examining whether cash hoards spur acquisitions. Based on the sample of acquirers and control firms, we therefore predict acquisition decisions using a logistic regression. We do

Table II. Regressions of the Acquisition Decision

The table presents results from logistic regressions of the choice to undertake acquisitions via stock, cash, or a mix. The default is no acquisition. In Panel A, the control sample of firms consists of all Compustat firms that were not involved in an M&A transaction in the past three years. In Panel B, the control sample consists of those that were not involved in M&As in the prior three years and belonged to the same industry, size, market-to-book, and momentum four-factor portfolios in the prior year. The book value of assets, debt ratio (long- and short-term debt scaled by book value of assets), cash ratio (cash and cash equivalents scaled by book value of assets), and market-to-book ratio are measured at the end of the fiscal year before the acquisition announcement. The prior one-year stock return is measured during the year ending five days before the acquisition announcement. Coefficients on industry and year dummies included in the regressions are not reported. *p*-Values are based on standard errors clustered by year.

	Cash Payment		**Stock Payment**		**Mixed Payment**	
	Coeff.	***p*-Value**	**Coeff.**	***p*-Value**	**Coeff.**	***p*-Value**
Panel A. Compustat Control Firms						
Intercept	−11.031	0.000	−10.282	0.000	−11.551	0.000
log Book value of assets	0.599	0.000	0.434	0.000	0.324	0.000
Debt ratio	−1.371	0.000	−1.322	0.000	−0.411	0.045
Cash ratio	−0.329	0.148	0.218	0.201	−0.342	0.300
Market-to-book ratio	0.002	0.015	0.003	0.000	0.000	0.954
Prior one-year return	0.038	0.239	0.102	0.199	0.038	0.023
Panel B. Control Firms Matched on Four Factors						
Intercept	−1.594	0.000	−2.088	0.000	−5.052	0.000
log Book value of assets	0.205	0.000	0.201	0.000	0.346	0.000
Debt ratio	−1.193	0.020	−1.092	0.001	−1.678	0.001
Cash ratio	0.636	0.225	−0.227	0.452	−0.039	0.955
Market-to-book ratio	−0.382	0.000	−0.036	0.042	−0.266	0.003
Prior one-year return	0.644	0.000	0.070	0.028	0.414	0.004

this separately for cash deals, stock deals, and mixed-payment deals and report the results in Table II. The control sample in Panel A includes all Compustat firms that were not involved in acquisitions during the prior three years. The control sample in Panel B includes firms that were not involved in acquisitions in the prior three years and belonged to the same industry, size, market-to-book, and momentum four-factor portfolios in the prior year. The independent variables include the log of book value of assets, the debt ratio, the market-to-book ratio, the stock return during the prior year, industry dummies, year dummies, and, most importantly, the cash ratio. Most variables, including those for the control firms, are measured at the end of the fiscal year before the acquisition announcement. The stock returns are estimated for the year ending five days before the respective announcements.

We find no evidence that high cash levels spur acquisitions, not even cash acquisitions. In particular, none of the cash coefficients in Panels A and B differs statistically from zero. In comparison, Harford (1999) reports a strong and positive relation between the adjusted cash ratio and acquisition likelihood, but he does not partition his analysis on the basis of payment, so it is unclear what payment category contributes to his results. If excess cash spurs acquisitions, as Harford (1999) concludes, we would expect that the effect of cash on acquisition decisions to primarily be present in the sample of acquisitions with cash payment. However, we find no evidence to support this.

Table III. Regressions of Bidder Returns

The table presents results from regressions of announcement returns for acquirers. The announcement returns are the abnormal stock returns from the day before through the day after the acquisition announcements using a one-factor market model, where the value-weighted index is used as a proxy for overall market returns and the estimation period spans from 250 to 10 days prior to the announcement. The market capitalization is estimated five days before the acquisition announcement and is transformed using the logarithm. The relative market capitalization of the target is the market capitalization of the target scaled by the sum of the market capitalizations of the acquirer and the target. The market-to-book ratio, cash ratio (cash and cash equivalents scaled by book value of assets), and debt ratio (debt scaled by book value of assets) are measured at the end of the fiscal year before the acquisitions announcement. The prior one-year stock return is measured during the year ending five days before the acquisitions announcement. Coefficients on industry and year dummies included in the regressions are not reported. *p*-Values are based on standard errors clustered by year.

	All		Cash Payment		Stock Payment		Mixed Payment	
	Coeff.	*p*-Value	Coeff.	*p*-Value	Coeff.	*p*-Value	Coeff.	*p*-Value
Intercept	0.045	0.001	0.104	0.000	−0.028	0.103	0.008	0.659
Market cap. of acquirer	−0.002	0.047	−0.005	0.000	0.001	0.439	−0.001	0.565
Relative mkt. cap. of target	0.000	0.679	0.000	0.706	−0.001	0.000	0.000	0.687
Debt ratio of acquirer	0.016	0.271	0.022	0.128	0.014	0.651	−0.005	0.807
Debt ratio of target	−0.005	0.553	0.006	0.532	−0.016	0.193	−0.017	0.531
Cash ratio of acquirer	−0.041	0.000	−0.004	0.694	−0.061	0.004	−0.041	0.169
Cash ratio of target	−0.005	0.566	0.008	0.403	−0.003	0.876	−0.038	0.101
Mkt-to-book ratio of acquirer	0.000	0.866	0.001	0.395	0.000	0.963	−0.002	0.750
Mkt-to-book ratio of target	−0.001	0.127	−0.002	0.296	−0.001	0.495	0.001	0.742
Prior return of acquirer	−0.005	0.012	−0.005	0.439	−0.005	0.021	0.002	0.771
Prior return of target	0.003	0.016	0.003	0.185	0.002	0.148	0.000	0.984
Stock payment dummy	−0.037	0.000						
Mixed payment dummy	−0.033	0.000						

In a related study, Pinkowitz et al. (2013) investigate whether firms with excess cash use this cash to pay for acquisitions. They report that firms with excess cash are more likely to finance acquisitions with stock than with cash.[1] Their results, like ours, cast doubt on the notion that cash hoards spur firms to make acquisitions that they otherwise would not make.

B. The Effect of Cash Holdings on Acquirers' Announcement Returns

In our next analysis, we examine the effect of cash holdings on the announcement returns of acquirers. In particular, we regress three-day abnormal announcement returns against cash ratios and a set of control variables.[2] Our objective is to examine whether announcement returns are negatively related to the cash holdings of acquirers, as in Harford (1999).

Table III presents the regression results. The first regression model includes all payment types and controls for average return differences across payment types via indicator variables

[1] While our sample and that of Harford (1999) involve only public targets, the vast majority of targets in the sample of Pinkowitz et al. (2013) involve private firms and subsidiaries. Thus, the results are not directly comparable.

[2] The results are similar if we use the Fama-French-Carhart four-factor model instead of the simple market model.

for stock payments and mixed payments. Likewise, Harford (1999) includes all payment types in his regressions and controls for payment types using an all-cash payment indicator variable, but he does not differentiate between all stock and mixed payments. The coefficients on the stock and mixed-payment indicator variables are −0.037 and −0.033, respectively. Thus, ceteris paribus, cash payments are associated with about 3% to 4% higher announcement returns, on average, than stock and mixed payments, similar to what the univariate means in Table I show. In comparison, Harford's (1999) regression results suggest that cash payments are associated with a little more than 1% higher announcement returns than the other payment categories.

The negative coefficient on the market capitalization of acquirers suggests that the announcement returns are lower for larger acquirers, consistent with Moeller et al. (2004). Furthermore, the coefficient of the relative market capitalization of targets is negative and statistically different from zero for the subsample of stock acquisitions and statistically insignificant for the other subsamples. This suggests that the announcement returns are lower when stock acquisitions are relatively large relative to the size of the acquirers. Given that the average announcement returns for the sample of stock acquisitions is negative, the effect of relative size on announcement returns is consistent with the argument of Schneider and Spalt (2016) that the transaction size simply scales the given gain or loss.

Finally, we get to the effect of acquirers' cash holdings. The regression model that includes all payment types shows that there is a negative relation between acquirers' cash holdings and their announcement returns. This is consistent with the results in Harford (1999). However, when we partition by payment type, we find that the negative relation is primarily attributable to acquisitions financed with stock (the coefficient is −0.061 with a p-value less than 0.01). For acquisitions financed with cash, there is no statistically significant relation between announcement returns and cash (the coefficient of acquirers' cash ratio is −0.004 with a p-value of 0.69).

The lack of evidence that firms with cash hoards have lower announcement returns when using that cash to make acquisitions seems inconsistent with the free cash flow theory and Harford's (1999) conclusion that such firms engage in value-decreasing behavior. In fact, there is no evidence here to suggest that firms with cash hoards spend that cash on value-decreasing acquisitions. That is, acquisitions financed with cash tend to be associated with positive announcement returns for the acquirers, and acquirers' cash holdings do not seem to modulate this tendency. It is possible that the market views it positively when firms with cash hoards are spending the cash on acquisitions, even if the acquisitions per se destroy value, because the alternative uses of the cash hoards are even worse. However, the operating performance results we discuss in detail later suggest that these acquisitions do not destroy value.

The negative relation between cash holdings and announcement returns for stock acquisitions is consistent with our overvaluation conjecture. Savor and Lu (2009) find evidence that firms choosing to finance acquisitions with stock are overvalued and that the negative stock price reaction accompanying announcements of such acquisitions reflects the capital market's realization of the overvaluation. In other words, stock financing signals to less informed outsiders that acquirers are overvalued, causing prices to drop. We extend this signaling story by suggesting that cash hoards can strengthen the negative signal associated with stock financing. In particular, we propose that firms with cash hoards have greater flexibility in choosing the payment method than firms with scarce cash. If so, a decision to leave cash hoards intact in favor of choosing stock is relatively more likely to be attributable to insiders' assessment that the shares are overvalued. We examine our conjecture further in the next section.

C. Overvaluation Analysis

In the earlier section, we document that the announcement returns are worse for acquirers with stock payment, especially if they have large cash holdings. We further propose that the poor returns reflect the capital market's realization upon announcements that firms with substantial cash that nevertheless choose to pay with stock are overvalued. In this section, we examine the overvaluation of acquiring firms more closely.

Examining whether firms are overvalued is inherently difficult. Prior studies use two general approaches. First, some studies estimate the fundamental value using public data—for example, based on the residual income model—and then compare this to the actual market value. Fu et al. (2013) use a refined version of this approach for a sample of acquisitions, and they document that acquirers with stock payment are more overvalued than acquirers with cash payment. We adopt the approach in Fu et al. (2013) for estimating overvaluation and refer to their appendix for details on the implementation. Second, studies like Savor and Lu (2009) examine subsequent stock returns, with the presumption that the capital market corrects any overvaluation over time.

Table IV presents the first part of our overvaluation analysis. Panel A presents mean and median estimates of overvaluation for acquirers across payment categories. These estimates suggest that all categories of acquirers are, on average, overvalued. Furthermore, the average overvaluation seems to increase monotonically with the proportion of stock; the average overvaluation is 0.250 for cash payment deals, 0.307 for mixed-payment deals, and 0.471 for stock payment deals. These statistics are comparable to Fu et al. (2013), who report average overvaluations of 0.33 for cash payment deals and 0.60 for stock payment deals.

We also examine overvaluation of the targets. Shleifer and Vishny (2003) predict that targets in stock acquisitions are less overvalued than acquirers. Panel B presents mean and median estimates of overvaluation for targets across payment categories. These estimates suggest that targets of acquisitions financed with stock, and, to a lesser extent, those financed with a mix of cash and stock, are overvalued. However, consistent with Shleifer and Vishny's (2003) prediction, a comparison of Panel A and Panel B suggests that the average overvaluation of acquirers is three times greater than the average overvaluation of targets in stock acquisitions.

Panel C presents regressions of the acquirer overvaluation estimates against indicator variables for stock and mixed payments, cash holdings, and interaction variables between payment indicator variables and cash holdings. The cash holdings are measured using continuous cash ratios or an indicator variable for whether the cash ratio is in the top quartile. Because the standard errors in these regressions are sensitive to clustering, we report both regressions with ordinary least squares (OLS) standard errors (models (a) and (b)) and regressions with standard errors clustered by year (models (c) and (d)).

Consistent with our univariate statistics and past literature, the coefficients on the stock payment indicator variables are positive (a little less than 0.2 with p-values less than 0.01). Thus, acquirers that pay with stock are, on average, more overvalued than acquirers that pay with cash. The coefficients on the mixed-payment indicator variables are also positive but not statistically different from zero.

Next, we examine whether stock acquirers are more overvalued when they have large cash balances. Therefore, we turn our attention to the interaction variables, and particularly the interaction between stock payment and the cash variables. Models (a) and (c) show that the coefficient of the interaction between stock payment and the cash ratio is 0.257, and it differs statistically from zero when we use OLS standard errors but not when we use clustered standard errors. In models (b) and (d), the coefficient of the interaction between stock payment and the high cash

Table IV. Analysis of Overvaluation

The table presents estimated overvaluations of the bidder and results from regressions of the estimated overvaluation. We follow the overvaluation estimation procedure in Fu et al. (2013), as described in detail in their appendix. Stock payment, cash payment, and mixed payment are indicator variables for the type of payment used in the acquisitions. The high cash indicator equals one if the cash ratio is in the fourth quartile and zero otherwise. Coefficients on industry and year dummies included in the regressions are not reported. *p*-Values in Panel C are based on OLS standard errors for models (a) and (b) and standard errors clustered by year for models (c) and (d).

Panel A. Overvaluation of Acquirers by Payment Method

	All		Cash Payment		Stock Payment		Mixed Payment	
	Stat.	***p*-Value**	**Stat.**	***p*-Value**	**Stat.**	***p*-Value**	**Stat.**	***p*-Value**
Average overvaluation	0.359	0.000	0.250	0.000	0.471	0.000	0.307	0.000
Median overvaluation	0.301	0.000	0.215	0.000	0.387	0.000	0.266	0.000

Panel B. Overvaluation of Targets by Payment Method

	All		Cash Payment		Stock Payment		Mixed Payment	
	Stat.	***p*-Value**	**Stat.**	***p*-Value**	**Stat.**	***p*-Value**	**Stat.**	***p*-Value**
Average overvaluation	0.124	0.000	0.066	0.003	0.166	0.000	0.132	0.000
Median overvaluation	0.093	0.000	0.012	0.071	0.143	0.000	0.109	0.000

Panel C. Regressions of Overvaluation of Acquirers

	Model (a)		Model (b)		Model (c)		Model (d)	
	Coeff.	***p*-Value**	**Coeff.**	***p*-Value**	**Coeff.**	***p*-Value**	**Coeff.**	***p*-Value**
Intercept	0.564	0.000	0.580	0.000	0.564	0.000	0.580	0.000
Stock payment	0.178	0.000	0.164	0.000	0.178	0.001	0.164	0.003
Mixed payment	0.043	0.319	0.041	0.282	0.043	0.345	0.041	0.668
Cash pymt x Cash ratio	0.069	0.576			0.069	0.651		
Stock pymt x Cash ratio	0.257	0.009			0.257	0.361		
Mixed pymt x Cash ratio	0.209	0.184			0.209	0.266		
Cash pymt x High cash ratio			−0.019	0.673			−0.019	0.688
Stock pymt x High cash ratio			0.146	0.001			0.146	0.143
Mixed pymt x High cash ratio			0.054	0.429			0.054	0.480
Adjusted R^2	0.137		0.138		0.137		0.138	

ratio indicator is also positive, but, again, it only differs statistically from zero when we use OLS standard errors and not when we use clustered standard errors.

In our alternative analysis of overvaluation, we examine long-term abnormal stock returns. We estimate the long-term abnormal returns over a (–1, +250) event window around the announcement date (as in Savor and Lu, 2009) based on the difference between buy-and-hold returns for the acquirers and the mean buy-and-hold return for benchmark portfolios, where benchmark portfolios consist of firms in the same industry that are not involved in any M&A deals in the previous three years, belong to the same size portfolio as measured by the market value of equity

Table V. Analysis of Long-Run Abnormal Stock Returns

The table presents long-run abnormal returns of the acquirers and results from regressions of the long-run abnormal returns. AR is the abnormal returns over a (–1, 250) event window around the announcement date and is computed as the difference between the buy-and-hold return for the acquirer and the mean buy-and-hold return for benchmark portfolios matched on either the industry, size, and market-to-book ratios (three factors) or the industry, size, market-to-book, and momentum (four factors). The matching firms were not involved in M&As during the prior three years. Stock payment, cash payment, and mixed payment are indicator variables for the type of payment used in the acquisitions. The high cash indicator equals one if the cash ratio is in the fourth quartile and zero otherwise. Coefficients on industry and year dummies included in the regressions are not reported. *p*-Values are based on standard errors clustered by year.

Panel A. Long-Run Abnormal Returns by Payment Method

	All		Cash Payment		Stock Payment		Mixed Payment	
	Stat.	*p*-Value	Stat.	*p*-Value	Stat.	*p*-Value	Stat.	*p*-Value
Average AR (three factors)	−0.091	0.000	−0.037	0.027	−0.150	0.000	−0.053	0.015
Median AR (three factors)	−0.074	0.000	−0.030	0.006	−0.106	0.000	−0.075	0.000
Average AR (four factors)	−0.155	0.001	0.012	0.885	−0.218	0.004	−0.168	0.008
Median AR (four factors)	−0.038	0.008	0.035	0.553	−0.036	0.013	−0.137	0.015

Panel B. Regressions of Long-Run Abnormal Returns

	Three Factors				Four Factors			
	Model (a)		Model (b)		Model (c)		Model (d)	
	Coeff.	*p*-Value	Coeff.	*p*-Value	Coeff.	*p*-Value	Coeff.	*p*-Value
Intercept	−0.006	0.909	0.009	0.839	−0.441	0.000	−0.043	0.000
Stock payment	−0.024	0.283	−0.061	0.006	−0.054	0.311	−0.091	0.023
Mixed payment	−0.007	0.801	−0.021	0.322	−0.073	0.054	−0.060	0.057
Cash pymt x Cash ratio	0.174	0.252			0.246	0.344		
Stock pymt x Cash ratio	−0.625	0.002			−0.588	0.091		
Mixed pymt x Cash ratio	−0.163	0.454			0.044	0.906		
Cash pymt x High cash ratio			0.069	0.174			0.110	0.275
Stock pymt x High cash ratio			−0.242	0.000			−0.259	0.030
Mixed pymt x High cash ratio			−0.040	0.722			−0.048	0.823
Adjusted R^2	0.077		0.075		0.084		0.082	

and the same market-to-book portfolio as the sample firms (i.e., three factors) and the same momentum portfolio (i.e., four factors).

Panel A of Table V shows that the average long-term abnormal returns are negative and statistically different from zero for stock deals and mixed-payment deals. For cash deals, the average long-term abnormal returns are either positive or negative, depending on whether the benchmark portfolios are based on three factors or four factors. Thus, Carhart's momentum factor makes a difference for the long-term abnormal return estimates. Nevertheless, the long-term abnormal returns are consistently most negative for stock payments and least negative (and possibly positive) for cash payments, similar to the pattern for the overvaluation measure.

Panel B presents regressions of the long-term abnormal returns, analogous to the overvaluation regressions presented earlier. Consistent with the univariate statistics, the coefficients of the stock payment indicator variable are negative in all models and statistically significant at the 0.01 level in model (b) and at the 0.10 level in model (d). More importantly, the coefficients of the interaction between stock payment and cash are consistently negative, with *p*-values ranging from less than 0.01 to 0.09 depending on which cash variable and benchmark portfolios we use. These results corroborate and even strengthen the overvaluation results in Table IV.[3]

Overall, the results in this section are consistent with our conjecture that acquirers that pay with stock are overvalued, especially when the acquirers' cash holdings are large. To the extent that the capital market interprets the acquisition announcements accordingly and rectifies the overvaluation, it explains the more negative announcement returns for acquirers that pay with stock, and the lower returns yet for stock acquirers with substantial cash holdings.

D. Subsequent Operating Performance

In our last analysis, we examine operating performance around acquisitions. We are primarily interested in gauging how preacquisition cash holdings affect postacquisition operating performance. This might yield further insight into the effect of cash holdings on the value creation (or destruction) in acquisitions.

An advantage of the operating performance analysis is that unlike the announcement return analysis, it should be immune to the effects of overvaluation. But the operating performance analysis also comes with several drawbacks. In particular, it depends heavily on a model for predicting the benchmark performance in the absence of acquisitions. Let us first explain our prediction model before we get to the details of the drawbacks.

We use a prediction model similar to that of Harford (1999). We first estimate operating performance before and after the acquisitions. Following Barber and Lyon (1996), operating performance is measured as operating income before depreciation, and we scale this by book value of assets net of cash. Operating performance after acquisitions is the average performance across years $+1$ and $+2$ relative to the acquisition years, while operating performance before acquisitions is the weighted average across the acquiring and target firms in year -1 relative to the acquisition years, using book value of assets net of cash as weights. Then we adjust operating performance by subtracting the weighted performance of control firms, where control firms for each acquirer and target are identified as firms in the same Fama-French 12 industries with the most similar cash levels before the acquisition and the weights are the same as those used to calculate operating performance before acquisitions for the acquiring and target firms. Finally, we employ a regression model that assumes a linear relationship between preacquisition adjusted performance and postacquisition adjusted performance.

To analyze the effect of cash holdings, we also add a cash holdings variable to the regression model. We assume that the intercept of the regression model reflects any average abnormal operating performance, while the coefficient of the cash holdings reflects any abnormal operating performance attributable to cash holdings.

[3] We also tried longer event windows for the long-term returns, in which case, the sample size shrinks and the noise increases, thus reducing statistical power. Based on the three-factor model for benchmarking, the coefficients of the interaction between stock payment and cash are consistently negative for event windows of two and three years. Furthermore, both *p*-values (for the coefficients of the two relevant interaction variables) remain below 0.05 for the event window of two years, but only one of the *p*-values remains below 0.05 for the event window of three years. Based on the four-factor model for benchmarking, the statistical significance fades for the longer event windows.

Table VI. Operating Performance

The table presents results from regressions of adjusted operating performance following acquisitions against adjusted operating performance before acquisitions and cash holdings. Operating performance is measured as operating income before depreciation scaled by book assets net of cash. Operating performance following acquisitions is the average performance across years +1 and +2 relative to the year of the acquisition. Operating performance before acquisitions is the weighted average across the acquiring and target firms in year −1 relative to the year of the acquisition, using book value of assets net of cash as weights. Operating performance is adjusted by subtracting the weighted performance of control firms. For each acquiring and target firm, a control firm is identified as the firm in the same Fama-French 12 industries with the most similar cash level. The weights are the same as those used to calculate operating performance before acquisitions for the acquiring and target firms. Cash ratios are cash ratios for acquiring firms before the acquisitions. The variables are winsorized at the 0.05 and 0.95 levels. Coefficients on industry and year dummies included in the regressions are not reported. *p*-Values are based on standard errors clustered by year.

	Cash Payment		Stock Payment		Mixed Payment	
	Coeff.	*p*-Value	Coeff.	*p*-Value	Coeff.	*p*-Value
Intercept	0.383	0.000	0.126	0.058	0.137	0.092
Cash ratio	0.092	0.477	0.185	0.026	0.762	0.001
Prior operating performance	0.578	0.000	0.541	0.000	0.347	0.024
Adjusted R^2	0.225		0.243		0.297	

There are several concerns with our prediction model, which, in turn, could give rise to biased results. First, Fama and French (2000) show that the relationship between past and future earnings is highly complex and cannot be fully captured in our simple regression equation. Second, acquisitions might be preceded by systematic earnings management (Erickson and Wang, 1999), which could muddle our estimates of operating performance before the acquisitions and even after the acquisitions as the earnings management naturally reverses over time. Third, accounting procedures for acquisitions could bias measures of performance changes (Custódio, 2014). Fourth, it is conceivable that cash holdings predict future performance irrespective of acquisitions. For example, firms with large cash holdings might be expected to exhibit superior future performance. If so, it is unclear whether a positive loading on cash holdings in the regression is attributable to acquisitions per se. Then again, this concern is alleviated by our matching procedure of selecting control firms with similar cash holdings.

Table VI presents the results of regressing adjusted postacquisition operating performance against adjusted preacquisition operating performance and cash holdings. The coefficients on preacquisition performance hover around 0.5 with *p*-values less than 0.01, showing that past performance is a strong predictor of future performance. The cash ratio coefficients are positive across all payment methods. However, they are only statistically significant at the 0.05 level for the stock and mixed-payment categories. Consequently, there is no evidence that acquirers with high cash holdings exhibit worse postacquisition operating performance. If anything, acquirers with high cash holdings that pay for at least a part of the acquisitions with stock exhibit superior postacquisition performance.[4]

In sum, the operating performance analysis suggests that high cash holdings do not induce value-destroying acquisitions. A further implication is that the negative relation between announcement

[4] If we instead match the control firms on the Fama-French-Carhart factors and the cash level, the cash ratio coefficients are statistically indistinguishable from zero.

returns and cash holdings of stock acquirers cannot be explained by greater value destruction among stock acquirers with high cash holdings. Rather, it points to alternative explanations for the relation between announcement returns and cash holdings, such as greater overvaluation of stock acquirers with high cash holdings.

III. Summary and Conclusion

In this study, we update and extend Harford's (1999) study on the effect of firms' cash holdings on their acquisition decisions. Harford concludes that firms with cash hoards undertake value-destroying acquisitions, as evidenced by lower announcement returns for acquirers with high cash holdings and other supportive results. Using a much larger and more recent sample, we replicate the negative relation between acquirers' announcement returns and their cash holdings. However, inconsistent with Harford's (1999) conclusion, we find that the negative relation is absent in the sample of acquisitions financed with cash. Instead, the relation is attributable to the sample of acquisitions financed with stock, which presumably could be undertaken even with limited cash holdings.

We introduce an alternative conjecture for the negative relation between acquirers' cash holdings and announcement returns for stock acquisitions. Building on Savor and Lu (2009), we conjecture that stock acquirers are overvalued and that the overvaluation is more pronounced when the acquirers choose to pay with stock despite substantial cash holdings. When acquisitions are announced, the capital market infers the overvaluation and rectifies it. This would explain the lower returns for stock acquirers and the even lower returns for stock acquirers with large cash holdings.

We also report more direct evidence on our overvaluation conjecture. Using the overvaluation measure from Fu et al. (2013), we replicate their finding that stock acquirers are more overvalued than cash acquirers. Similarly, the abnormal long-term stock returns are more negative after stock acquisitions than after cash acquisitions. More importantly for the purposes of our study, we report evidence that the overvaluation of stock acquirers, especially as indicated by poor long-term stock returns, increases with their cash holdings.

In sum, while our study replicates key findings in Harford (1999), conducting separate analyses for different payment categories and adding an analysis of overvaluation lead us to a different conclusion. While Harford (1999) concludes that cash holdings induce worse acquisitions, we conclude that high cash holdings are related to overvaluation, and this overvaluation is corrected upon the announcement, leading to the misconception that those acquisitions destroy value for the shareholders.

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