Reference Prices, Relative Misvaluation, and the Timing of M&A Announcements*

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Abstract

The bidder's relative value with respect to the target (RV) and its 52-week reference values affect who bids for whom, the timing of deal announcement, offer terms, and the likelihood of deal completion. Deals that are announced when the RV is near its 52-week high feature more stock payment, higher offer premium relative to the target's pre-announcement price but a larger discount relative to the target's 52-week high price, result in more negative announcement returns for the bidding firm in both the short and long run, and are less likely to be completed. Yet, bidders in such deals also experience large and positive abnormal returns over the period from private initiation of discussions with the target to twelve months after announcement. Our results suggest that bidders use past values of RV as reference points to assess relative misvaluation and to strategically choose announcement timing.

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Introduction

There is substantial evidence in the literature that 52-week reference prices affect the behavior of both investors (George and Hwang (2004) and Huddart et al. (2009)) and corporate managers (e.g., Heath et al. (1999)). In the mergers and acquisitions (M&A) market, Baker et al. (2012) show that the target's 52-week high price affects the offer price and probability of deal acceptance, whereas Ma et al. (2019) show that bidders earn lower short-run announcement returns when their pre-announcement prices are closer to their 52-week high price. Although these studies show that 52-week high prices affect investor perceptions in the M&A market, it is not clear whether reference prices also affect managerial decisions more broadly in terms of who bids for whom and the timing of deal announcement. Based on the similarity between M&A transactions and exchange options, the theoretical literature argues that the timing of merger activity has significant value implications for the bidder and target firms, and predicts that the relative equity market value of the bidder with respect to the target (RV) should play an important role in the timing of M&A activity (e.g., see Morellec and Zhdanov (2005)).[1] Accordingly, in this paper we examine whether the 52-week high and low reference values of RV affect who bids for whom and the *timing* of deal announcements. If so, what's the effect on deal terms and the likelihood of deal completion? Do long-term shareholders of the bidding firm benefit from announcement timing based on reference prices?

Our focus on announcement timing is also motivated by the observation that, in practice, stock prices leading up to the announcement of the deal have a significant bearing on offer terms. The bid premium is usually computed by comparing the offer price to the target's pre-announcement price; similarly, the exchange ratio is often compared to the pre-announcement

[1]The main insight of this literature is that M&A transactions may be viewed as option exercise games in which shareholders exercise the option to exchange their firm's shares or assets for the other firm's shares or assets (see Lambrecht (2004), Morellec and Zhdanov (2005), and Hackbarth and Morellec (2008)). Therefore, as in any option exercise game, the timing of exercise has significant value implications for both sets of shareholders. Using this insight, Morellec and Zhdanov (2005) develop an equilibrium framework for the joint determination of the timing and terms of M&A transactions.

ratio of the target's stock price to the bidder's stock price. Therefore, a bidder may have incentives to initiate and announce deals when the target seems relatively undervalued with respect to the bidder.[2] Although the literature has examined the effects of bidders' and targets' misvaluation on merger activity (e.g., Rhodes-Kropf et al. (2005) and Dong et al. (2006)), the role of relative misvaluation and its effects on announcement timing, offer terms, and deal success have not been explored. If bidders strategically choose the timing of deal announcements, then understanding the endogeneity of timing is important because it has implications for whether long-term shareholders of bidding firms gain from M&A deals.

To examine the role of the 52-week reference values of RV, we create a measure called *normalized relative value* (NRV) which compares the RV on any given date t to the range of relative values during a 52-week reference window preceding date t. Formally, we define $NRV_t = \frac{Log(RV_t)-Log(RV_{low})}{Log(RV_{high})-Log(RV_{low})}$, where RV_{low} and RV_{high} denote the low and high values, respectively, of RV for the bidder-target pair over the 52-week reference window preceding date t. The RV is a measure of how valuable the bidder is with respect to the target, and is important in practice because it may affect the method of payment, the exchange ratio in stock deals, and the bidder's ability to raise financing for cash deals.[3] Let NRV_{ann} denote the normalized relative value at announcement. Hence, NRV_{ann} of close to one (zero) implies that the deal is announced when the bidder's RV is close to its 52-week high (low) value. We provide examples of four high-NRV_{ann} deals and four low-NRV_{ann} deals in Figures 1 and 2, respectively.

If managers use 52-week reference prices to assess firm value, then NRV should affect bidders' choice of who to bid for, and the timing of deal announcement for a given bidder-target pair. We refer to this as the "reference-price timing" hypothesis, and note that this

[2]We highlight strategic behavior of bidders because most M&A deals are initiated by the bidders, and the bidder is significantly larger than the target, on average. Also, Masulis and Simsir (2018) show that targets are more likely to initiate deals when they are in a weak financial or competitive position. Therefore, on average, the bidder may have greater bargaining power in deciding when to initiate and announce M&A deals.

[3]Moreover, in a real options framework, Morellec and Zhdanov (2005) show that the M&A option is exercised only if the RV exceeds a specific threshold.

effect may arise either as an irrational behavioral phenomenon or as a rational response to stock misvaluation (see Section 1 for details). As per this hypothesis, a higher NRV_{ann} indicates that the timing of the announcement is more to the relative advantage of the bidding firm. If so, we also expect NRV_{ann} to affect deal terms and outcomes, over and above the effect of firm and deal characteristics at announcement. It is plausible that NRV_{ann} is correlated with misvaluation measures used by Rhodes-Kropf et al. (2005) and Dong et al. (2006) (henceforth, RRV and $DHRT$, respectively), although the important distinction is that NRV compares current RV to its 52-week reference values whereas the latter compare stock prices at announcement to model-based measures of fundamental value. To highlight this distinction, we examine the effect of NRV on merger activity after controlling for the RRV and $DHRT$ measures of overvaluation.

We show that NRV affects who bids for whom as well as the timing of public announcement for bidder-target pairs that announce deals. Formally, we use a conditional logit approach (see Bena and Li (2014)) to show that NRV has a significant positive effect on the likelihood of the bidder-target match when actual bidder-target pairs are compared to control pairs of firms that are very similar in terms of size, Q, and industry classification. Next, for the bidder-target pairs that announce deals, we show using a Cox proportional hazard model that NRV has a positive effect on the deal announcement hazard. For a subset of deals in our sample, we are able to identify the month in which the bidder and target started private negotiations ("private initiation") by hand-collecting this information from merger documents available on SEC EDGAR. Using this information, we show that NRV has a positive effect on deal initiation hazard and that deals progress quicker from private initiation to public announcement when the bidder's relative value at initiation is closer to its 52-week high.

Deals announced at a higher NRV are less likely to be pure-cash deals, and are likely to pay for a larger fraction of the deal in stock. Moreover, target shareholders receive a higher offer premium relative to the target's pre-announcement price when the deal is announced at a higher NRV, possibly as a partial compensation for the disadvantageous timing from their perspective.[4] However, the offer price is also at a higher *discount* relative to the target's 52-week high price in deals that are announced at a higher NRV. In a similar vein, we find that in stock deals announced at a higher NRV, the exchange ratio offered to target shareholders is at a higher premium relative to the pre-announcement ratio of target's stock price to the bidder's stock price, but is at a wider discount relative to the 52-week high value of this ratio. These findings suggest that announcing the deal at a higher NRV could be to the strategic advantage (disadvantage) of the bidding (target) firm. Target firms seem to be aware of this strategic aspect of announcement timing because we find that deals announced at a higher NRV are more likely to fail ex post, especially due to the target's refusal.

An important finding is that the bidder's short-run announcement return is negatively related to NRV_{ann}, and this effect is *not reversed* in the long run. Regardless of the methodology for computing long-run abnormal return, we find a persistent negative relationship between NRV_{ann} and bidders' abnormal return over the 12-month period following deal announcement, which suggests that a high NRV is at least partly driven by bidder overvaluation. Thus, the effect of NRV on merger activity is not entirely due to an irrational behavioral bias, and may partially reflect a rational response to perceived misvaluation.

Do long-term shareholders of bidding firms benefit from deals announced at high NRV? This is a difficult question to answer because we do not observe the counterfactual scenario if the bidder had announced the deal at a different time. Nonetheless, if we treat private initiation as the point at which the bidder started contemplating the merger, then a partial answer to this question can be obtained by examining how the bidders' long-run return from the time of private initiation to 12 months after the public announcement varies with NRV_{ann} in the cross-section. We find that this relation is positive and significant: i.e., bidder

[4]This finding is consistent with the idea that the target's 52-week high price serves as an important reference point in determining the offer price (Baker et al. (2012)). Because the gap between the target's pre-announcement price and its 52-week high price is likely to be wider in deals announced at a higher NRV, the offer premium relative to the target's pre-announcement price would have to be higher if the target's 52-week high price affects the choice of offer price.

shareholders in high-NRV_{ann} deals experience superior long-run performance from private initiation to 12 months after public announcement (a 16-month period for the median deal) compared to bidders in low-NRV_{ann} deals, even after accounting for the more negative short- and long-run announcement returns in high-NRV_{ann} deals. This finding is important because the traditional announcement returns approach would have concluded that bidder shareholders do worse in the high-NRV_{ann} deals, but after taking into account the strategic timing of the deal announcement, it may be that long-term shareholders of bidding firms actually do better in high-NRV_{ann} deals.

Our paper contributes to several strands of the literature. It is related to Baker et al. (2012) and Ma et al. (2019), who highlight the role of the target's 52-week high price and the bidder's 52-week high price, respectively, in shaping the perceptions of investors in the M&A market. We contribute to this literature by showing that 52-week reference values of RV affect not only investor perceptions but also key managerial decisions in the M&A market, such as who bids for whom, the timing of public announcements, method of payment, and offer terms. Our finding of a negative relationship between NRV_{ann} and bidders' short-run announcement return is related to the reference price effect in Ma et al. (2019), who find that bidders earn lower short-term announcement returns when their pre-announcement price is near their 52-week high price. Despite this similarity, the board conclusions of our paper are very different from theirs. Unlike Ma et al. (2019), we conclude that reference-price timing is not entirely an irrational behavioral phenomenon, and may partially reflect a rational response to perceived misvaluation. This explains why deals announced at higher NRV are more likely to be financed with stock, are more likely to fail ex post, and feature more negative long-run announcement returns for the bidding firm. By contrast, Ma et al. (2019) find that their reference price effect on short-run bidder announcement returns is reversed in the year following the announcement, and does not affect the method of payment. The main reason for these differences is that Ma et al. (2019) focus on the role of bidders' 52-week high price, whereas we examine the role of 52-week reference values of RV. Moreover, our sample only includes deals involving publicly-traded targets (so that we may compute RV and NRV), whereas deals with private targets account for roughly 75% of the sample in Ma et al. (2019) and their results are significantly stronger in case of deals with private targets.

Our paper is also related to the literature on misvaluation and merger activity (Rhodes-Kropf et al. (2005), Dong et al. (2006), Ang and Cheng (2006), and Ben-David et al. (2015)). Most of this literature identifies misvaluation by comparing the bidder's and target's stock prices with their respective model-based estimates of fundamental value; an exception is Ben-David et al. (2015), who identify misvaluation using short-selling activity. By contrast, our NRV measure compares the current relative value to its 52-week high and low reference values. We find that the effects of NRV on merger activity are consistent with a misvaluation story. Notably, the effects of NRV continue to hold even after controlling for the RRV or $DHRT$ overvaluation measures, which suggests that 52-week reference prices may contain value-relevant information independent of the model-based estimates of fundamental value.

Finally, our paper contributes to the debate on whether bidder shareholders benefit from M&A activity. The general consensus in the literature based on announcement returns is that bidding shareholders either do not gain or appear to lose out on average (see Andrade et al. (2001), Moeller et al. (2005), and Betton et al. (2008)), although a small but growing literature casts doubt on this consensus by appealing to the anticipation effect and the revelation effect (e.g., see Bhagat et al. (2005), Cai et al. (2011), and Wang (2018)).[5] Our paper highlights that announcement returns may not fully reflect the gains to long-term shareholders of bidding firms once the endogeneity of the announcement timing is taken into account.

Among other things, this insight has implications for the debate over whether overval-

[5]The anticipation effect argument is that if part of the market's reaction occurs before the deal is announced publicly, then announcement returns capture only the unanticipated component of the bidder's gains, thus biasing estimates downward (Cai et al. (2011)). The revelation effect argument is that the deal announcement induces the market to reassess the bidder's stand-alone value, thus confounding estimates of merger gains (Bhagat et al. (2005)). Wang (2018) provides a quantitative assessment of the anticipation effect and the revelation effect. He shows that, after adjusting for these effects, M&As create significant value and bidders capture a large portion of these gains.

ued bidders create value for their long-term shareholders by using their equity as currency in takeovers: Savor and Lu (2009) and Golubov et al. (2016) argue that they do, but Fu et al. (2013) dispute this conclusion by pointing out that bidder overvaluation is associated with higher offer premiums and higher target $CAR[-1, +1]$ in stock deals (also see Akbulut (2013)), which they attribute to CEO-related agency problems. Consistent with Fu et al. (2013), we find that higher NRV_{ann} is associated with higher offer premiums and higher target $CAR[-1, +1]$. However, if the deal was announced following a large increase (decrease) in the bidder's (target's) stock price, then it is hard to interpret the negative bidder $CAR[-1, +1]$ or positive target $CAR[-1, +1]$ as evidence that long-term shareholders of the bidding firm are at the losing end of the transaction. While CEO-related agency problems are no doubt important (Harford et al. (2012)), our analysis points to another likely explanation which may also be important: if the timing of the deal is to the bidder's relative advantage, then the bidder may have to offer a higher premium as a sop to get the approval of the target shareholders to compensate them for their relative disadvantage, which, in turn, causes the bidder's (target's) announcement return to be lower (higher).

1 Theoretical Background

There are two broad channels through which 52-week reference prices may affect M&A activity. First, market participants may be subject to an irrational behavioral bias which causes them to use 52-week reference prices as "anchors" to estimate firm values even if these reference prices are irrelevant. Alternatively, it may be that 52-week reference prices contain value-relevant information, so that NRV is a measure of relative misvaluation. In this case, the effect of NRV of merger activity will reflect a rational response to stock price misvaluation. We discuss both these ideas before outlining the predictions of the reference-price timing hypothesis.

1.1 Anchoring

The anchoring-and-adjustment heuristic was demonstrated by Tversky and Kahneman (1974), who showed in an experimental setting that subjects used irrelevant initial estimates provided to them as anchors while estimating an unknown quantity, and failed to adjust away sufficiently from the initial estimate. In real-life settings, anchoring effects have been used to explain why sale prices of paintings at art auctions depend on their previous sale prices (Beggs and Graddy (2009)), why agents' valuations in the housing market depend on the listing price posted by sellers (Northcraft and Neale (1987)), and why listing prices in the housing market may depend on the purchase price paid by sellers (Genesove and Mayer (2001)).

In equity markets, 52-week high and low prices are easily available to all market participants, and a growing literature documents that these reference prices affect the behavior of investors and corporate managers. For instance, Heath et al. (1999) show that corporate executives are more likely to exercise stock options when their company's stock price crosses past its 52-week high; George and Hwang (2004) show that a stock price's proximity to its 52-week high predicts both short-run and long-run returns better than traditional momentum strategies; and Huddart et al. (2009) document a significant increase in trading volume when a stock's price crosses its 52-week high. In the context of the M&A market, Baker et al. (2012) show that the target's recent peak prices affect offer prices and probability of deal acceptance, whereas Ma et al. (2019) show that acquirers earn lower announcement returns when their pre-announcement stock prices are near their 52-week highs.

1.2 Misvaluation and M&A activity

An important idea in the literature is that M&A activity is affected by stock price misvaluaton, that is, divergence of stock prices from their fundamental values (see Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004)). This literature predicts that bidding firms are more likely to be overvalued than target firms, and that bidders are likely to pay for undervalued targets using cash. On the other hand, overvalued bidders are likely to use stock as method of payment when acquiring targets that are also overvalued, but less so than the bidder. Empirical support for these predictions are found in Rhodes-Kropf et al. (2005), Dong et al. (2006), Ang and Cheng (2006), and Ben-David et al. (2015).

The findings of the misvaluation literature are relevant for us because it is plausible that NRV may be a proxy for relative misvaluation. However, an important distinction is that NRV compares relative value to the range of its 52-week reference values, whereas the literature defines misvaluation of each individual firm with respect to a model-based measure of fundamental value. Therefore, to differentiate the reference price effect from the misvaluation effect, we will examine the effect of NRV on merger activity after controlling for the measures of misvaluation used in past studies.

1.3 The Reference-Price Timing Hypothesis

In our setting, a higher NRV indicates that the bidder's relative value with respect to the target is close to the higher end of its 52-week reference range. Therefore, if managers use 52-week reference prices to assess firm value, then NRV should affect bidders' choice of who to bid for, and the timing of deal announcement for a given bidder-target pair. Specifically, we expect that, all else equal, a higher NRV increases the likelihood of a bidder-target pair announcing a deal compared to other firm-pairs that are very similar in terms of size, Q, and industry classification. For bidder-target pairs that announce a deal, we expect that NRV has a positive effect on the deal announcement hazard.

As per the reference-price timing hypothesis, a higher NRV_{ann} indicates that the timing of the deal is more to the perceived relative advantage of the bidding firm. Therefore, NRV_{ann} should affect deal terms and outcomes, over and above the effect of firm and deal characteristics at announcement. If NRV is a proxy for relative misvaluation, then deals announced at a higher NRV should feature more stock payment as the bidder seeks to use its relatively overvalued stock as currency. At the same time, the bidders in such deals should offer a higher bid premium relative to the target's pre-announcement price (and a higher exchange ratio in case of stock deals relative to the pre-announcement ratio of stock prices) to partially compensate the target shareholders for the disadvantageous timing from their perspective.

The higher offer premium combined with the perceptions of relative misvaluation also predict that there should be a negative (positive) relationship between NRV_{ann} and bidder (target) announcement returns. Moreover, if NRV is a proxy for misvaluation, then there should also be a negative relationship between NRV_{ann} and long-run bidder announcement returns. On the other hand, if the effect of NRV of announcement timing is primarily due to an irrational behavioral bias, then the negative relationship between NRV_{ann} and bidder announcement returns should be reversed in the long run.

The reference-price timing hypothesis also predicts that deals announced at a higher NRV should be more likely to fail, especially due to the target's refusal which may believe that the timing is to its relative disadvantage. The key to this prediction is that even though target shareholders in high-NRV_{ann} deals receive a higher bid premium relative to their pre-announcement price, they may still feel underpaid if RV is close to its 52-week high value. The following excerpts from a news article regarding the proposed acquisition of C&S/Sovran Corporation by NCNB Corporation illustrates this point and highlight the importance of relative values and market timing:

> "Shareholders of the target bank have plenty of reasons to be disappointed by the past, and to regret that NCNB did not buy the C&S part of C&S/Sovran two years ago... *It is not so much the current absolute value of the NCNB offer in cash that needs to be considered, as the relative valuations of the two stocks and companies.* Last fall, C&S/Sovran price, at $18.375 a share, was 96 percent of the NCNB level of $19.125. On a relative basis, C&S/Sovran hit bottom on May 31 (roughly one month before the deal announcement), when its price of $18.75 was just 45 percent of NCNB price of $42.125. ...The NCNB offer thus

> is generous based on this spring's stock market perception, but stingy based on last fall's ... they are getting an offer with a price that is effectively 30 percent below the original one, in terms of NCNB shares."[6]

We note that the reference-price timing hypothesis does not necessarily contradict the Q-hypothesis of takeovers, which focuses on the efficiency gains from mergers, and relates these to the bidder's Q and target's Q (see Lang et al. (1989), Servaes (1991), and Jovanovic and Rousseau (2002)). Even if the merger is motivated mainly by efficiency gains or tax considerations, the bidder may still choose to announce the deal when the relative valuation is to its advantage. To account for efficiency gains, we control all our regressions for the Q at announcement as well as other firm and deal characteristics.

2 Data and Key Variables

2.1 Data sources

We obtain data on mergers and acquisitions from the Securities Data Company (SDC) U.S. M&A database, financial data from COMPUSTAT, and stock price data from the Center for Research in Security Prices (CRSP) daily stock price database. We use SEC EDGAR to collect information on deal initiation months (see Masulis and Simsir (2018)). In case of deals that were announced and subsequently withdrawn, we use Lexis-Nexis to collect information on the reasons for deal failure.

We begin with a sample of U.S. M&A deals announced between 1985 and 2015. As is standard in the literature, we require that: (a) the deal value is at least $1 million and at least 1% of the acquirer's market capitalization; (b) neither the bidder nor the target belongs to the utilities sector (SIC code between 4900 and 4999) or the financial services sector (SIC codes between 6000 and 6999); and (c) the bidder owns less than 50% of the

[6] From the article "Market Place; On NCNB's Bid, a Waiting Game" published in New York Times on July 10, 1991 (article available at http://www.nytimes.com/1991/07/10/business/market-place-on-ncnb-s-bid-a-waiting-game.html)

target firm shares outstanding prior to the transaction and owns 100% after the transaction. In addition, given our focus on relative equity values, we also require that both the bidder and target firms are public firms listed on the NYSE, AMEX, or Nasdaq, and have share price and shares outstanding data available in the CRSP daily stock price database.

There are 3,644 deals that meet these sample requirements.[7]

2.2 Key variables

Timing of M&A announcements:

We define the bidder's relative value on date t as $RV_t = \frac{V_t^B}{V_t^T}$, where V_t^B and V_t^T denote the market value of equity (computed using the day's closing stock prices) of the bidder and target, respectively. Clearly, RV_t will depend on the relative size of the bidder with respect to the target. Therefore, to compare RV with its reference prices and to facilitate comparison across deals, we define a normalized relative value (NRV) for each bidder-target pair as follows:

$$NRV_t \equiv \frac{Log(RV_t) - Log(RV_{low})}{Log(RV_{high}) - Log(RV_{low})}, \tag{1}$$

where RV_{high} and RV_{low} denote the high and low values, respectively, of RV for the bidder-target pair over the 52-week reference window preceding date t. We choose the 52-week reference window in line with Baker et al. (2012); our results are robust to other reference windows, such as 39 weeks or 26 weeks.

To account for possible delays between the decision date and the actual announcement date, we measure all firm characteristics at announcement using the closing share prices 21 trading days prior to announcement (we use the subscript *ann* to identify this day).[8] We measure the timing of M&A announcements using the bidders' normalized relative value at

[7] Moeller et al. (2005) point out that deals announced during the merger wave of 1998–2001 destroyed shareholder value on an massive scale. Therefore, in unreported tests, we verify that all our results below are robust to the exclusion of deals announced during this period.

[8] Our qualitative results are not sensitive to this choice: we obtain similar results if we use other dates, such as 10 trading days, 5 trading days or 2 trading days prior to the announcement date.

announcement (i.e., NRV_{ann}). Thus, NRV_{ann} of close to one (zero) implies that the deal is announced when the bidder's relative value is close to its 52-week high (low).

As per the exchange option view of M&As, the RV at which the deal is announced also depends on relative valuation uncertainty (Morellec and Zhdanov (2005)). We measure relative valuation uncertainty using σ^{RV}, which is defined as the standard deviation of daily percentage changes in RV over the 52-week reference window.

Shareholder returns:

We assess short-run performance of the bidding and target firms using their cumulative abnormal return (CAR) over the 3-day trading-day window surrounding the announcement date, where CAR is defined as raw return minus the return on the value-weighted CRSP index.

We use buy-and-hold abnormal returns ($BHAR$) over the window from the month of deal announcement to 12 months after announcement to assess the long-run performance of the bidding firms. We compute $BHAR$ using the following procedure. Following Barber and Lyon (1997), we first identify firms whose market value of equity is between 70% and 130% of the value of the bidding firm. We then choose firms closest to the bidding firm in terms of book-to-market ratio (i.e., inverse of Q). While Barber and Lyon (1997) suggest that a single matching firm approach can resolve issues arising from the positive skewness of long-term abnormal returns, Savor and Lu (2009) argue that, in relatively small samples, matching portfolio approach is more suitable due to possible mismatches. Therefore, we compute $BHAR$ using two methods: a $BHAR_{Matched\ Firm}$ using a single matching firm, and a $BHAR_{Matched\ Portfolio}$ using the portfolio of 10 matching firms.[9] $BHAR$ is defined as the buy-and-hold return on the bidder's stock over the holding period minus the buy-and-hold return of the control stock or portfolio over the same period.

[9] Our qualitative results are unchanged if we use the portfolio of 5 matching firms. We also obtain qualitatively similar results if we use the Rau and Vermaelen (1998) approach of computing abnormal returns relative to benchmark portfolios based on size and book-to-market.

We also assess bidders' long-run performance using the calendar-time portfolio approach advocated by Fama (1998). Each month we form equally-weighted portfolios consisting of all firms that announced a bid within the last 12 months. The portfolios are rebalanced monthly, with those bidders that reach the end of the holding period dropping out and new bidders coming in. We then calculate the mean monthly abnormal portfolio return (α) for each portfolio by regressing its excess return on the three Fama and French (1993) factors.

2.3 Summary statistics

We present summary statistics for our sample in Panel A of Table 1.

[Insert Table 1 here]

The median (average) value of NRV_{ann} is 0.619 (0.571), which suggests that the median (average) M&A deal is announced when the bidder's relative value is closer to its 52-week high than its 52-week low. This seems reasonable because, in practice, M&A deals are more likely to be initiated by the bidders (Masulis and Simsir (2018)). However, there is substantial cross-sectional variation in NRV_{ann} across deals, as can be seen from the $25^{th}-$ and $75^{th}-$percentile values of NRV_{ann}.

Among the deals for which we have information on offer premium, the average offer premium is 31%. In terms of method of payment, 31.4% of the deals in our sample are cash-only offers (identified using the *All Cash* dummy), whereas 56.7% of deals involve some stock payment (identified using the *Stock* dummy).

Failed is a dummy variable that identifies deals that were not successfully completed. In our sample, 653 deals (17.9% of all deals announced) failed to be completed. Based on a reading of news reports from the Lexis-Nexis database, we classify the reasons for deal failure as follows: 166 deals (25.42%) failed due to the target's refusal; 59 deals (9.04%) failed because the bidder withdrew the offer; 108 deals (16.54%) failed because a competitor won the bid; 112 deals (17.15%) were terminated by "mutual consent"; 48 deals failed due to regulatory issues (7.35%); and in 160 deals (24.50%), we did not have sufficient information to determine the reason for failure. We note that this composition is similar to that of the previous studies which hand-collected the reasons for deal failure (e.g., Savor and Lu (2009)).

The summary statistics on short-run announcement returns are largely consistent with previous studies (see Betton et al. (2008) for a recent survey). On average, bidders experience negative short-run announcement returns, whereas the short-run announcement returns to the target firm are large and positive. We discuss long-run announcement returns in Section 5.3 below.

Panel B shows that, as expected, NRV_{ann} is positively (negatively) correlated with the bidder's (target's) Q and the RRV and $DHRT$ overvaluation measures.

3 Reference Prices and M&A Activity

We begin our analysis by examining whether NRV affects who bids for whom (i.e., the bidder-target match) and the timing of deal announcement for a given bidder-target pair.

3.1 Determinants of the Bidder-Target Match

We examine the effect of NRV on the likelihood of bidder-target match using the conditional logit approach of Bena and Li (2014). For each actual bidder-target pair, we create ten control pairs of firms that did not announce a merger, but are very similar in terms of relative size, relative Q and industry classification to the bidder-target pair. Specifically, we create five pairs in which the actual target is paired with five non-bidders that are very similar to the bidder, and five pairs in which the actual bidder is paired with five non-targets that are very similar to the target firm.[10] We define a dummy variable *Actual Pair Dummy*, which takes the value of 1 for the actual bidder-target pair that announced a merger, and the value 0 for the ten control pairs that did not. We then estimate logistic regressions in which *Actual*

[10]Within the actual bidder's (target's) industry, pair firms are selected based on their Mahalanobis distance with respect to the bidder's (target's) size and Q.

Pair Dummy is regressed against NRV_{ann} and other control variables. The results of this estimation are presented in Table 2.

[Insert Table 2 here]

The positive coefficient on NRV_{ann} in column (1) indicates that, compared to similar pairs of firms, the likelihood of a bidder making an offer for a target increases when the bidder's relative value with respect to the target is closer to its 52-week high. This result is robust to controlling for the Q (column (2)) and RRV overvaluation measure (column (3)) of each firm in the pair.[11]

3.2 Reference Prices and Announcement Timing

We employ a Cox proportional hazard model to examine the effect of NRV on the timing of deal announcement for bidder-target pairs that announce deals. These results are presented in Table 3.

[Insert Table 3 here]

For each deal, we create 12 observations corresponding to each calendar month $t \in [-1, -12]$ before the announcement date, and compute the NRV_t corresponding to each of these observations. Note that $NRV_{-1M} = NRV_{ann}$ because NRV_{ann} is computed based on equity values 21 trading days (i.e., approximately a calendar month) prior to the announcement date. We then estimate a Cox proportional hazard model with deal fixed effects to understand how NRV_t affects deal announcement hazard. The positive and significant coefficient on NRV_t in column (1) indicates that deal announcement becomes more likely as NRV_t increases.

[11]In unreported tests, we have verified that all our results are also robust to controlling for the $DHRT$ overvaluation measures of the bidder and target at announcement. However, the sample sizes in these regressions are significantly smaller because the $DHRT$ measure is based on analyst forecasts, which are only available for a subset of bidder and target firms. Therefore, to conserve space, we only report the regression specifications with the RRV measures of overvaluation as controls.

For a subset of 1,084 deals in our sample, we are able to identify the month in which the bidder and target started negotiations ("deal initiation") by hand-collecting this information from merger documents available on SEC EDGAR (see Ahern and Sosyura (2014) and Masulis and Simsir (2018)).[12] Using a similar approach as in column (1), we estimate a Cox proportional hazard model with deal fixed effects to understand how NRV_t (for $t \in [-1, -12]$ months) affects deal initiation hazard. The positive and significant coefficient on NRV_t in column (2) indicates that deal initiation becomes more likely as NRV_t increases.

In column (3) we estimate a Cox proportional hazard model which only uses the observations between the month of deal initiation and announcement. The positive and significant coefficient on NRV_t indicates that deals move quicker from initiation to public announcement as NRV_t increases.

Let $NRV_{initate}$ denote the NRV at the beginning of the month of deal initiation. In column (4), we estimate an OLS specification to understand how the time between deal initiation and deal announcement (in months) varies with $NRV_{initate}$, conditional on various bidder and target characteristics at announcement (our qualitative results are unchanged if we control for characteristics at deal initiation). The negative coefficient on $NRV_{initate}$ indicates that deals progress quicker from initiation to announcement when the bidder's relative value at initiation is closer to its 52-week high.

4 Announcement Timing and Deal Terms

We estimate regressions that are variants of the following form in order to examine the effect of announcement timing (NRV_{ann}) on deal terms, such as the method of payment, offer

[12] We were able to identify the month of initiation for 1,095 deals. However, we exclude 4 deals because the month of initiation was erroneously reported as falling after the public announcement of the deal, and 7 deals in which the time between initiation and announcement exceeded 36 months.

premium, and exchange ratio in case of stock deals:

$$Y_{jt} = \alpha + \beta * NRV_{ann} + \sum_{i \in \{B,T\}} \psi_i * Q^i_{ann} + \boldsymbol{\gamma} X^B_{t-1} + \boldsymbol{\lambda} X^T_{t-1} + \mu_{industry} + \mu_t + \epsilon_{j,t} \tag{2}$$

The above regression controls for the bidder's Q and target's Q at announcement, as well as other relevant characteristics of the two firms. In particular, we control for overvaluation measures for both the bidding and target firm to differentiate the reference-price effect from the effect of overvaluation relative to fundamental value. We include industry fixed effects at the 2-digit SIC level ($\mu_{industry}$) and year fixed effects (μ_t) to control for the effect of industry factors and macroeconomic factors that may affect deal terms.

4.1 Effect of NRV_{ann} on Method of Payment

In this section we estimate regression (2) to understand how the method of payment varies with NRV_{ann}, the results of which are presented in Table 4. We estimate Probit specifications in columns (1) and (2): the dependent variable in column (1) is *All Cash*, a dummy variable that identifies deals in which cash is the only method of payment, whereas the dependent variable in column (2) is *Stock*, a dummy variable that identifies deals in which at least some of the payment is in the form of the bidder's stock. In columns (3) and (4), we estimate OLS specifications with *% Stock Payment* as the dependent variable, which denotes the percentage of total consideration that is paid in the form of stock.

[Insert Table 4 here]

Our results indicate that NRV_{ann} has a significant effect on the method of payment. All else equal, high-NRV_{ann} deals are less likely to be pure-cash deals, more likely to involve stock payment, and are likely to have a larger fraction of the payment made in the form of stock.[13] These results are also economically significant: for instance, the coefficient estimate

[13]The sample size in columns (3) and (4) is smaller because the *% Stock Payment* variable is not available for every deal. We also estimate a Tobit specification in an unreported test because *% Stock Payment* is

in column (3) indicates that a one-standard deviation increase in NRV_{ann} is associated with a 4.93% increase in *% Stock Payment*, which is large compared to its sample average of 53.3%. The coefficients on Q^{B}_{ann}, Q^{T}_{ann}, and other control variables are consistent with prior studies, such as Dong et al. (2006).

The positive coefficient on RRV^{B}_{OV} in column (4) is consistent with findings in the literature that overvalued bidders are more likely to pay with stock. However, the coefficient on NRV_{ann} continues to be significant even after controlling for overvaluation of bidder and target firms.

4.2 Effect of NRV_{ann} on Offer Premium

Next, we estimate regression (2) with *Offer Premium* as the dependent variable. Recall that *Offer Premium* is the logarithm of the ratio of the initial offer price to the target's pre-announcement price. The results of our estimation are presented in Panel A of Table 5. Apart from all the controls described above, we also include the target's 52-week high price (scaled by its pre-announcement price) as an additional control because Baker et al. (2012) show that this is an important determinant of the offer premium.

[Insert Table 5 here]

The positive coefficient on NRV_{ann} in column (1) indicates that targets in deals with higher NRV_{ann} are paid a higher offer premium relative to their pre-announcement price. This result is robust to controlling the RRV overvaluation measures (column (2)) of the bidder and target firms. The coefficient estimate in column (1) suggests that a one-standard deviation increase in NRV_{ann} is associated with a 5.05% increase in offer premium, which is large compared to its mean value of 31%. Consistent with the reference-point argument in Baker et al. (2012), we find that offer premium has a strong positive relation with the

censored below at 0 and censored above at 100. The results are qualitatively similar. A related finding from unreported tests is that high NRV_{ann} deals are less likely to be tender offers. Given that tender offers have to be completed with cash, these results are consistent with our results on method of payment and with the theoretical predictions in Offenberg and Pirinsky (2015).

target's 52-week high price scaled by its pre-announcement price. The offer premium is also high in deals where the bidder is large compared to the target.

In columns (3) and (4), we estimate the regression in column (1) separately for pure-cash deals (i.e., *All Cash*= 1) and deals that feature stock payment (i.e., *Stock* = 1), respectively. As can be seen, the positive relationship between offer premium and NRV_{ann} is present in both subsamples, but is significantly stronger among deals that involve some stock payment. Indeed, a χ^2 test for the difference in coefficients on NRV_{ann} between columns (3) and (4) reveals that the difference is statistically significant with a $p-$value of 0.002. This difference is to be expected because target shareholders should be more concerned about the bidder's relative overvaluation if they are being compensated using the bidder's stock.

Baker et al. (2012) argue that offer prices in M&A transactions (P^T_{offer}) often cluster around the target's 52-week high price (P^T_{52High}), which is an important reference price used by target shareholders to assess the offer. If so, this can lead to a mechanical positive relation between NRV_{ann} and *Offer Premium*, because targets in high NRV_{ann} deals are likely to be trading farther away from their 52-week high price. To investigate this possibility, we re-estimate all the regressions in Panel A with $Log(P^T_{offer}/P^T_{52High})$ as the dependent variable. The results of these regressions are presented in Panel B.

The negative coefficients on NRV_{ann} in Panel B indicates that targets in high-NRV_{ann} deals receive a lower price relative to their 52-week high price. This effect is robust, both in economic and statistical terms, to controlling for the effects of the RRV overvaluation measures (column (2)) of the bidder and target. Moreover, this effect holds for both pure-cash deals and stock deals (columns (3) and (4)).

In Panel C, we focus on stock deals only and examine how the exchange ratio varies with NRV_{ann}. Note that the exchange ratio varies across deals based on ratio of target's stock price to bidder's price. To adjust for these differences, we follow the approach in Fu et al. (2013) and scale the exchange ratio reported in SDC (ER) using the ratio of target's stock price to bidder's price at announcement (P^T_{ann}/P^B_{ann}). Accordingly, the dependent variable in columns (1) and (2) is $Log(\frac{ER}{(P^T_{ann}/P^B_{ann})})$. The positive coefficient on NRV_{ann} in column (1) indicates that, all else equal, the exchange ratio offered to target shareholders in stock deals is higher in deals with higher NRV_{ann}. This effect is robust, both in economic and statistical terms, to controlling for the RRV overvaluation measures (column (2)) of the bidder and target.

The regressions in columns (3) and (4) are aimed at examining how the exchange ratio compares with the highest exchange ratio that target shareholders could have received based on stock price movements over the 52-week reference window. To investigate this question, we define ER_{52High} as the 52-week high value of the ratio, P^T/P^B, which is used as a reference for determining exchange ratios in stock deals. We then estimate the regressions with $Log(ER/ER_{52High})$ as the dependent variable. The negative coefficient on NRV_{ann} in column (3) indicates that target shareholders in high-NRV_{ann} deals receive a lower exchange ratio relative to the 52-week high value of P^T/P^B. Moreover, this effect is robust to controlling for the RRV overvaluation measures (column (4)) of the bidder and target.

Overall, the results in Panel C indicate that although target shareholders in high-NRV_{ann} stock deals receive a higher exchange ratio in comparison to the target's relative stock price at announcement (P^T_{ann}/P^B_{ann}), the exchange ratio they receive is still significantly lower relative to the 52-week high value of P^T/P^B.

Taken together, the findings in Panels A through C suggest that announcing the deal at a higher NRV could be to the advantage (disadvantage) of the bidding (target) firm.

5 Announcement Timing and Deal Outcomes

5.1 Effect of NRV_{ann} on Short-Run Announcement Returns

Next, we use regression (2) to examine the relation between NRV_{ann} and the short-term announcement returns ($CAR[-1,+1]$) of the bidding and target firms. The results of our estimation are presented in Table 6. The dependent variable is *Bidder* $CAR[-1,+1]$ in Panel

A, *Target* $CAR[-1,+1]$ in Panel B, and *Combined* $CAR[-1,+1]$ in Panel C. We obtain similar results for other announcement windows, such as $[-3,+3]$, $[-5,+5]$, and $[-10,+10]$.

[Insert Table 6 here]

We estimate the regression on the full sample in columns (1) and (2), and then separately for pure-cash deals and stocks deals in columns (3) and (4), respectively. The negative coefficient on NRV_{ann} in columns (1) and (2) indicates that there is a negative relation between *Bidder* $CAR[-1,+1]$ and NRV_{ann}, which is robust to controlling for the RRV overvaluation measures of the bidder and target. However, the results in columns (3) and (4) indicate that this negative relationship is confined to stock deals only and is absent among pure-cash deals. These patterns are consistent with the reference-price timing hypothesis, and may arise partly in response to the higher offer premium and partly as correction for the perceived relative overvaluation of the bidder in high NRV_{ann} deals. This finding is also related to that in a recent paper by Ma et al. (2019), who use a normalized bidder value similar to what we propose and show that the bidder's CAR is more negative in deals where the bidder's stock price at announcement is closer to its 52-week high.

The results in Panel B are the opposite of those in Panel A, and indicate a robust positive relation between *Target* $CAR[-1,+1]$ and NRV_{ann}, which is present among both pure-cash and stock deals. Again, these patterns are consistent with the reference-price timing hypothesis, and may arise partly as correction for the target's perceived undervaluation and partly in response to the higher offer premium in high NRV_{ann} deals.

In Panel C, we examine the relation between NRV_{ann} and the *Combined* $CAR[-1,+1]$, which is defined as the value-weighted average of the *Bidder* $CAR[-1,+1]$ and *Target* $CAR[-1,+1]$, and serves as a measure of the market's estimate of combined value gain from the merger. Interestingly, we find that there exists no relation between the *Combined* $CAR[-1,+1]$ and NRV_{ann}, which suggests that NRV_{ann} is purely a measure of announcement timing, and does not reflect the synergies from the merger in any way. We note that the coefficients on the control variables that proxy for the efficiency gains from the merger are consistent with those in past studies, such as Dong et al. (2006).

5.2 Effect of NRV_{ann} on Likelihood of Deal Failure

The reference-price timing hypothesis predicts that the likelihood of deal completion should be lower for high-NRV_{ann} deals because target shareholder should be less likely to approve a deal if they perceive that the timing and terms of the deal are to their disadvantage. To test this, we estimate regression (2) using a Probit specification with *Failed* as the dependent variable. The estimation results are presented in Table 7.

[Insert Table 7 here]

The positive and significant coefficient on NRV_{ann} in column (1) indicates that, all else equal, deals announced at a higher NRV are more likely to fail ex post. This effect is highly economically significant: the coefficient estimate in column (1) indicates that a one-standard deviation increase in NRV_{ann} from its mean value, while holding all other covariates fixed at their respective means, increase the likelihood of deal failure by 1.69%, which is large in comparison to its mean value of 17.9%.

Recall that for a subset of failed deals, we are able to categorize the reasons for deal failure (see Section 2.3 above for details). To test the more precise prediction of the reference-price timing hypothesis, we define the dummy variable *Failed due to Target's Refusal* to identify deals that failed due to the target's refusal, and use it as the dependent variable in columns (2) and (3). The positive coefficient on NRV_{ann} indicates that deals announced at a higher NRV are indeed more likely to fail due to lack of target's approval, and this effect holds even after controlling for the RRV overvaluation measures of the bidder and target. The results in column (3) also indicate that deal failure is more (less) likely if the bidder (target) is more overvalued relative to its fundamental value at announcement.

5.3 Effect of NRV_{ann} on Long-Run Announcement Returns

In this section, we examine the long-run performance of the bidding firms, and investigate how these vary with the NRV at announcement and the success or failure of the deal. Because deal failure is endogenous and is affected by NRV_{ann} (see Table 7), we will only focus on "exogenous failures" in this section, which are defined to include failures due to regulatory issues or competing bidders (see Savor and Lu (2009)). That is, exogenous failures are driven by factors that are more likely to be beyond the control of the bidding and target firms. The results of our analysis are presented in Table 8.

[Insert Table 8 here.]

In Panels A and B, we examine the buy-and-hold abnormal returns ($BHAR$) of bidders over the period from the month of deal announcement ($0M$) to 12 months after announcement ($+12M$). We present the univariate analysis in Panel A, and multivariate analysis in Panel B. As described in Section 2, we compute $BHAR$ using two different methods: a $BHAR_{Matched\ Portfolio}$ using the portfolio of matched firms to compute the benchmark return, and a $BHAR_{Matched\ Firm}$ using a single matching firm to compute the benchmark return.

We define "High NRV_{ann}" ("Low NRV_{ann}") to identify deals with NRV_{ann} greater than or equal to (lower than) the sample average. As can be seen from the columns in Panel A, the average bidder's $BHAR_{Matched\ Portfolio}[0M, +12M]$ is significantly more negative in high-NRV_{ann} deals compared to low-NRV_{ann} deals, regardless of whether the deal is completed or not ex post. We find similar patterns with $BHAR_{Matched\ Firm}[0M, +12M]$ and the calendar-time portfolio returns.

The rows in Panel A indicate that, among high-NRV_{ann} deals, the average bidder's $BHAR_{Matched\ Portfolio}[0M, +12M]$ is significantly more negative among deals that fail for exogenous reasons compared to deals that are completed. However, among low-NRV_{ann} deals, the average bidder's $BHAR_{Matched\ Portfolio}[0M, +12M]$ does not vary significantly based on whether the deal is completed or not. We find similar patterns with $BHAR_{Matched\ Firm}[0M, +12M]$

and calendar-time portfolio returns.

We present the results of the multivariate analysis in Panel B, where the dependent variable is $BHAR_{Matched\ Portfolio}[0M, +12M]$ in columns (1) through (3), and $BHAR_{Matched\ Firm}[0M, +12M]$ in columns (4) through (6).[14] The negative coefficient on NRV_{ann} indicates that bidders in high-NRV_{ann} deals experience more negative abnormal returns over the 12-month period following the announcement of the deal, and this result holds even after controlling for the RRV overvaluation measures of the bidder and target (columns (3) and (6)). This is a significant difference between our paper and Ma et al. (2019), who find that the reference price effect on short-run bidder announcement returns is temporary and is reversed in the year following the announcement. The fact that the negative relation between NRV_{ann} and short-run bidder announcement return is not reversed in the long run suggests that NRV_{ann} is partly driven by bidder overvaluation.

In columns (2) and (4), we also include an interaction term between NRV_{ann} and *Exogenous Failure*. Consistent with the univariate results in Panel A, the coefficient on this interaction term is negative but it is not statistically significant.

The dependent variable in Panel C is the bidder's long-run abnormal return from the month in which it initiated private discussions with the target to 12 months after the public announcement of the deal ($BHAR[init, +12M]$ using the two methods). The idea is that if we treat private initiation as the point at which the bidder started contemplating the merger, then the relationship between $BHAR[init, +12M]$ and NRV_{ann} can tell us whether long-term shareholders of bidding firms benefit from deals announced at high NRV. Recall that we have information on the month of private initiation for only a subsample of deals.

The positive coefficient on NRV_{ann} in Panel C indicates that bidder shareholders in high-NRV_{ann} deals experience superior long-run performance from private initiation to 12 months after public announcement (a 16-month period for the median deal) compared to bidders in low-NRV_{ann} deals, even after accounting for the more negative short- and long-run

[14] We cannot estimate similar regressions with calendar-time portfolio α as the dependent variable, because these are computed for portfolios and not for individual bidders.

announcement returns in high-NRV_{ann} deals.[15] This effect is robust to controlling for the RRV overvaluation measures of the bidder and target at announcement.

The finding in Panel C is important because the traditional announcement returns approach would have interpreted the negative relationship between NRV_{ann} and bidder announcement returns as suggesting that bidder shareholders do worse in the high-NRV_{ann} deals. However, after taking into account the strategic timing of the deal announcement, it may be that long-term shareholders of bidding firms do better in high-NRV_{ann} deals.

6 Conclusion

We study whether the 52-week high and low reference values of the bidder's relative equity market value with respect to the target (RV) affect managerial decisions in the M&A market, in terms of who bids for whom and the timing of deal announcements. To do this, we create a measure called the normalized relative value measure (NRV_t) which takes a higher (lower) value if RV on date t is closer to its high (low) value over the 52-week window preceding date t.

We show that NRV affects who bids for whom as well as the timing of public announcement for bidder-target pairs that announce deals. Moreover, the NRV at which a deal is announced also affects the method of payment, offer terms, and the likelihood of successful completion. In particular, deals that are announced when the bidder's relative value is closer to its 52-week high feature higher offer premium relative to the target's pre-announcement price but a larger discount relative to the target's 52-week high price, result in more negative announcement returns for the bidding firm in both the short and long run, and are less likely to be completed. Yet, bidders in such deals also experience large and positive abnormal returns over the period from private initiation of discussions with the target to twelve months after announcement.

[15] In an unreported univariate test, we verify that the calendar-time approach yields qualitatively similar results.

The totality of our findings suggest that a high NRV is at least partly reflective of bidder relative overvaluation, which explains why deals announced at high NRV are more likely to be paid with stock and why bidders in such deals experience more negative abnormal returns over the 12-month period following the announcement of the deal. Thus, the effect of NRV on merger activity is not entirely due to an irrational behavioral bias, and may reflect a rational response to misvaluation.

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Appendix A Definitions of Variables

We obtain information on stock prices and returns from the CRSP Daily Stock Files database. Information on deal characteristics is obtained from the SDC U.S. Mergers and Acquisitions database. Superscripts ‘B’ and ‘T’ denote bidder and target, respectively.

A.1 Key Variables:

- $RV_t = V_t^B / V_t^T$ is the bidder’s relative value on date t, where V_t^B and V_t^T denote the market value of equity of the bidder and target, respectively, computed using the closing prices on date t.

- $NRV_t = \frac{Log(RV_t) - Log(RV_{low})}{Log(RV_t) - Log(RV_{low})}$, where RV_{high} and RV_{low} denote the high and low values, respectively, of RV over the 52-week reference window preceding date t.

- NRV_{ann} is the NRV computed 21 trading days prior to announcement (we use the subscript ‘ann’ to denote this date). Therefore, the 52-week reference window corresponds to the trading-day window $[-273, -21]$, where day 0 is the announcement date.

- Offer Premium: Log difference between initial offer price per common shares (SDC item ‘PR_INITIAL’) and the target price one month prior to the announcement date.

- All Cash: A dummy variable that identifies deals in which the payment is entirely in cash.

- Stock: A dummy variable that identifies deals in which the method of payment includes stock.

- % Stock Payment: The fraction of deal value that is paid in the form of stock (as reported on SDC).

- Failed: A dummy variable that equals to 0 if the deal is eventually consummated (SDC “Deal Status” code ‘C’ and ‘U’) and 1 otherwise.

- $CAR[-1, +1]$: Difference between the firm’s raw return and the return on the value-weighted CRSP market index over the window $[-1, +1]$, where day 0 is the announcement date.

- $BHAR_{\text{Matched Portfolio}}$: Difference between bidder’s return and benchmark portfolio return over the holding period. The benchmark portfolio consists of 10 matched firms with closest book-to-market ratio to the bidder’s book-to-market ratio, among the firms whose market value of equity is between 70% and 130% of the bidder’s value.

- $BHAR_{\text{Matched Firm}}$: Difference between bidder’s return and a single matched firm’s return over the holding period. Matched firm has the closest book-to-market ratio to the bidder’s book-to-market ratio, among the firms whose market value of equity is between 70% and 130% of the bidder’s value.

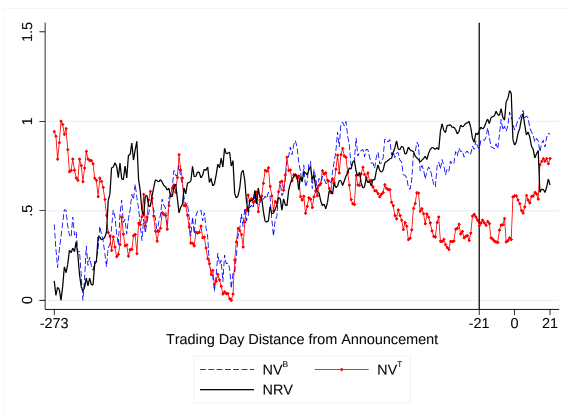
- Calendar-time portfolio α: Each month we form equally-weighted portfolios consisting of all firms that announced a bid within the last 12 calendar months. The portfolios are rebalanced monthly, with those bidders that reach the end of the holding period dropping out and new bidders coming in. We then calculate the mean monthly abnormal portfolio return (α) for each portfolio by regressing its excess return on the three Fama and French (1993) factors.

A.2 Other/Control Variables:

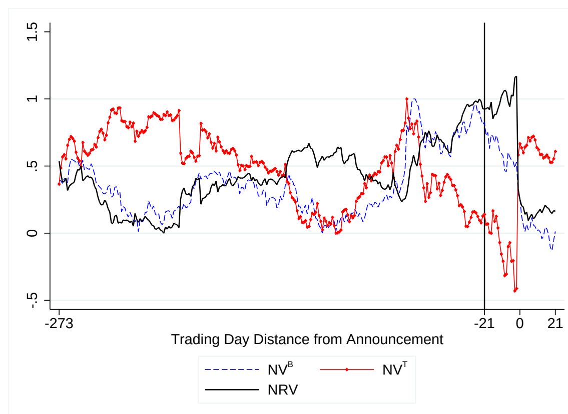
- Deal Value: Deal value reported by the SDC, in million 2014 dollars.
- Size: Market value of equity one month prior to the date of announcement.
- Relative Size: Ratio of bidder size to target size.
- Leverage: Ratio of long-term debt ('dltt') to total assets ('at').
- Q_{ann}: Ratio of the sum of a firm's market value of equity and its book value of debt ('dltt'+'dlc') to the sum of book values of equity ('seq') and debt, computed using the closing stock price 21 trading days prior to announcement.
- σ^{RV}: Standard deviation of the daily percentage changes in RV over the 52-week reference window preceding announcement, annualized by multiplying $\sqrt{252}$.
- Target 52 High: Log difference between a target firm's 52-week high price and the target share price one month prior to the announcement, similar to Baker et al. (2012).
- RRV_{OV}: Misvaluation measure of Rhodes-Kropf et al. (2005), calculated following the procedure of Fu et al. (2013).
- $DHRT_{OV}$: Misvaluation measure of Dong et al. (2006), which is the ratio of price to "residual income value," where the residual income value is calculated using analyst forecasts of earnings.

Figure 1: Plot of Normalized Valuations: High NRV_{ann} Deals

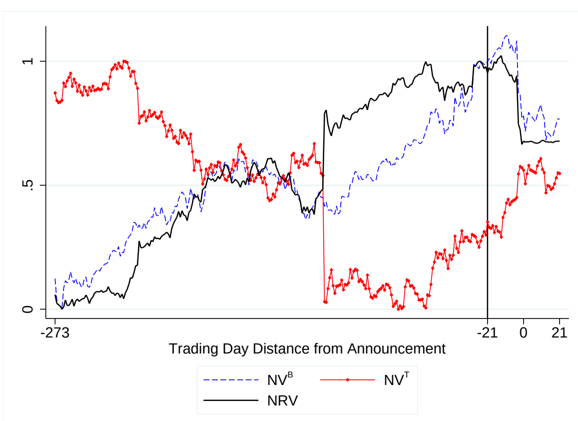
This figure presents the daily plots of normalized valuations for large U.S. M&A deals (whose deal values are at least $10 billion) with the highest NRV_{ann} values that were announced after 2001 and resolved during our sample period. All the variables are defined in the Appendix. NV^B and NV^T are similar to NRV except that they are computed using the stock price and 52-week reference prices of the bidder and target, respectively.



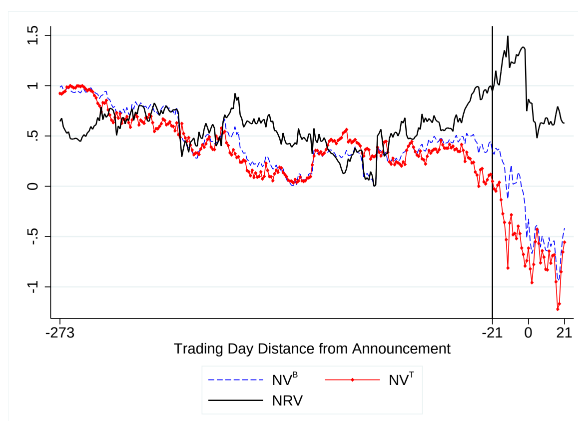
(a) Oracle & Peoplesoft (2003)
$NRV_{ann} = 0.93;\ NV^B = 0.86;\ NV^T = 0.45$



(b) Microsoft & Yahoo (2008)
$NRV_{ann} = 0.93;\ NV^B = 0.81;\ NV^T = 0.13$



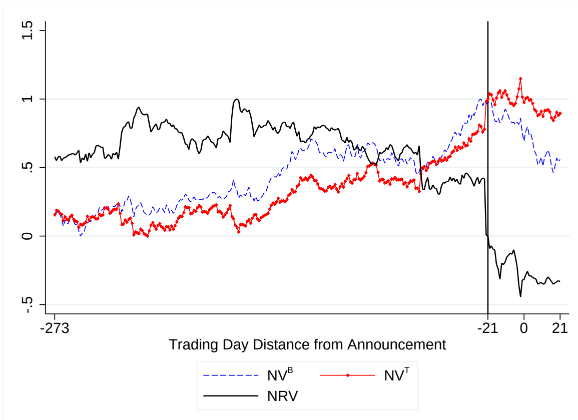
(c) Symantec & Veritas Software (2004)
$NRV_{ann} = 0.98;\ NV^B = 0.99;\ NV^T = 0.30$



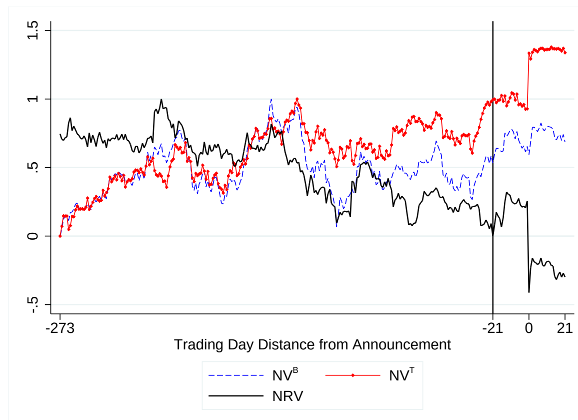
(d) Centurylink & Embarq (2008)
$NRV_{ann} = 1;\ NV^B = 0.45;\ NV^T = 0.12$

Figure 2: Plot of Normalized Valuations: Low NRV_{ann} Deals

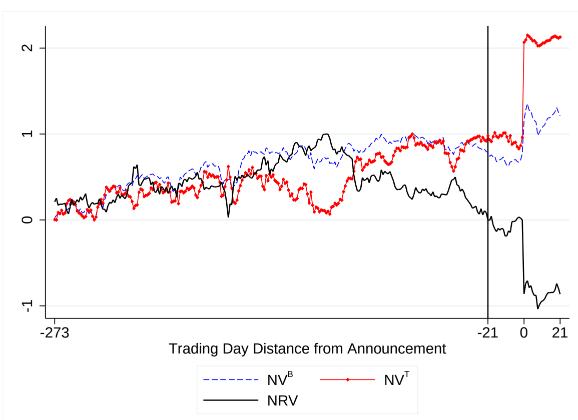
This figure presents the daily plots of normalized valuations for large U.S. M&A deals (whose deal values are at least \$10 billion) with the lowest NRV_{ann} values that were announced after 2001 and resolved during our sample period. All the variables are defined in the Appendix. NV^B and NV^T are similar to NRV except that they are computed using the stock price and 52-week reference prices of the bidder and target, respectively.



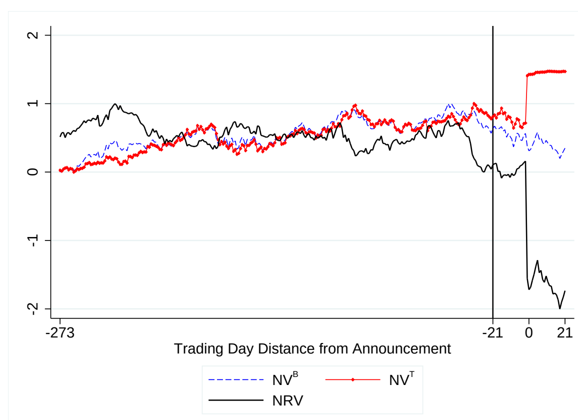
(a) Chevron & Unocal (2005)
$NRV_{ann} = 0$; $NV^B = 0.96$; $NV^T = 1$



(b) Freeport-McMoRan & Phelps Dodge (2006)
$NRV_{ann} = 0$; $NV^B = 0.51$; $NV^T = 0.99$



(c) Becton Dickinson & Carefusion (2014)
$NRV_{ann} = 0$; $NV^B = 0.79$; $NV^T = 0.98$



(d) Anadarko Petroleum & Kerr-McGee (2006)
$NRV_{ann} = 0.04$; $NV^B = 0.58$; $NV^T = 0.79$

Table 1: Summary Statistics

Our sample includes 3,644 M&A announcements reported by SDC, for the period 1985-2015. Panel A presents the descriptive statistics and Panel B lists the pair-wise correlations between NRV_{ann} and the other key variables used in our analysis. All the variables are defined in the Appendix. Asterisks in Panel B denote significance at the 10% level.

Panel A. Descriptive Statistics

	N	Mean	Std. Dev.	P25	Median	P75
Deal and Firm Characteristics:						
NRV_{ann}	3,644	0.571	0.306	0.312	0.619	0.840
σ^{RV}	3,644	8.259	28.303	0.236	0.441	1.215
Deal Value ($ million)	3,644	2714.274	10209.193	117.823	422.118	1535.283
Market Value of Assets^{B} ($ million)	3,564	16613.109	47265.200	653.807	2812.864	11107.599
Market Value of Assets^{T} ($ million)	3,461	2835.044	9927.447	134.131	435.037	1625.739
Relative Size	3,644	17.586	30.219	2.003	5.385	17.738
Offer Premium	2,380	0.310	0.280	0.169	0.293	0.449
All Cash	3,644	0.314	0.464	0.000	0.000	1.000
Stock	3,644	0.567	0.496	0.000	1.000	1.000
% Stock Payment	3,210	0.533	0.447	0.000	0.609	1.000
Failed	3,644	0.179	0.384	0.000	0.000	0.000
Hostile Offer Dummy (1=Hostile)	3,644	0.045	0.208	0.000	0.000	0.000
Tender Offer Dummy (1=Tender)	3,644	0.244	0.430	0.000	0.000	0.000
Time from Initiation to Announcement (Month)	1,084	4.667	4.870	2	3	6
Q^{B}_{ann}	3,559	3.096	3.365	1.365	2.051	3.398
Q^{T}_{ann}	3,461	2.456	2.552	1.140	1.657	2.699
Leverage^{B}	3,560	0.192	0.184	0.032	0.159	0.289
Announcement Returns:						
Bidder $CAR[-1,+1]$	3,644	-0.011	0.088	-0.053	-0.009	0.028
Target $CAR[-1,+1]$	3,644	0.220	0.267	0.059	0.177	0.331
$BHAR_{Matched\ Portfolio}[0M,+12M]$	3,555	-0.047	0.505	-0.345	-0.073	0.191
$BHAR_{Matched\ Firm}[0M,+12M]$	3,555	-0.042	0.674	-0.375	-0.037	0.304

Panel B. Correlations

	NRV_{ann}
RRV^{B}_{OV}	0.182*
RRV^{T}_{OV}	-0.180*
$DHRT^{B}_{OV}$	0.110*
$DHRT^{T}_{OV}$	-0.005
σ^{RV}	0.087*
Log of Relative Size	0.047*
Log of Target Size	-0.116*
Q^{B}_{ann}	0.134*
Q^{T}_{ann}	-0.130*
Leverage^{B}	0.013

Table 2: Likelihood of Bidder-Target Match: Conditional Logit Model

This table reports the result of conditional logit regressions that examine the effect of NRV on the likelihood of bidder-target match. For each actual bidder-target pair, we create ten control pairs of firms that did not announce a merger, but are very similar in terms of relative size, relative Q and industry classification to the bidder-target pair. The dummy variable *Actual Pair Dummy* takes the value 1 for the actual bidder-target pair that announced a merger, and the value 0 for the ten control pairs that did not. We then estimate logistic regressions in which *Actual Pair Dummy* is regressed against NRV_{ann} and other control variables. All the variables are defined in the Appendix. Standard errors reported in parentheses are robust to heteroskedasticity and are clustered at the deal level. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) level.

Model:	Conditional Logit		
Dependent variable:	Actual Pair Dummy		
	(1)	(2)	(3)
NRV_{ann}	0.286***	0.276***	0.274***
	(0.046)	(0.047)	(0.048)
Q^B_{ann}		0.013**	0.005
		(0.006)	(0.007)
Q^T_{ann}		0.019**	0.001
		(0.009)	(0.011)
RRV^B_{OV}			0.103***
			(0.025)
RRV^T_{OV}			0.108***
			(0.025)
Deal FEs	✓	✓	✓
Pseudo R^2	0.001	0.001	0.002
N	35,807	34,977	33,010

Table 3: Timing of Deal Initiation, Timing of Announcement, and $\mathbf{NRV_{ann}}$

This table reports the results of tests that examine the effect of NRV on the timing of deal announcement (column (1)), timing of deal initiation (column (2)), and the time between initiation and announcement (column (3) and (4)). In column (1) (column (2)) we estimate a Cox proportional hazard of the number of months between day t and the day of deal announcement (month of initiation), denoted T, where $t \in [T-1M, T-2M, \ldots, T-12M]$ and M equals 21 trading days (i.e., roughly a calendar month). Hence, each deal has up to twelve observations with different "Time to Announcement" ("Time to Initiation"), where deal-specific characteristics are controlled using deal fixed effects. In column (3) we estimate a Cox proportional hazard model which uses the observations between the month of deal initiation and announcement. In column (4) we estimate an OLS regression with months between deal initiation and announcement as the dependent variable and $NRV_{initiate}$ as the main independent variable of interest, where *initiate* denotes the beginning of the month of deal initiation. All the variables are defined in the Appendix. Standard errors reported in parentheses are robust to heteroskedasticity and are clustered at the deal level in columns (1) through (3), and at the bidding firm level in column (4). Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) level.

Model of:	Time to Announcement	Time to Initiation	Time from Initiation to Announcement	
	(1)	(2)	(3)	(4)
NRV_t	0.151***	0.322***	0.489***	
	(0.053)	(0.101)	(0.125)	
$NRV_{initiate}$				-1.463**
				(0.630)
σ^{RV}				-0.008***
				(0.003)
Q^B_{ann}				-0.068*
				(0.038)
Q^T_{ann}				-0.169***
				(0.051)
Log of Relative Size				0.220
				(0.146)
Log of Target Size				0.021
				(0.097)
Leverage^B				-1.070
				(0.864)
Constant				6.995***
				(0.749)
Deal FEs	✓	✓	✓	
Specification	Cox hazard	Cox hazard	Cox hazard	OLS
R^2				0.029
N	41,086	11,406	8,137	990

Table 4: Determinants of Method of Payment

This table reports the result of regressions that examine the relationship between the method of payment and NRV_{ann}. The dependent variable is *All Cash* in column (1), *Stock* in column (2), and *% Stock Payment* in columns (3) and (4). We estimate Probit regressions in columns (1) and (2) and OLS regressions in columns (3) and (4). We include bidder industry fixed-effects and year dummies in all columns. All the variables are defined in the Appendix. Standard errors reported in parentheses are robust to heteroskedasticity and are clustered at the level of the bidding firm. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) level.

Dependent Variable:	All Cash	Stock	% Stock Payment	
	(1)	(2)	(3)	(4)
NRV_{ann}	-0.440***	0.499***	0.161***	0.124***
	(0.087)	(0.083)	(0.025)	(0.026)
RRV_{OV}^{B}				0.118***
				(0.011)
RRV_{OV}^{T}				-0.020
				(0.014)
σ^{RV}	-0.001	0.002**	0.000*	0.000
	(0.001)	(0.001)	(0.000)	(0.000)
Q_{ann}^{B}	-0.081***	0.108***	0.022***	0.002
	(0.016)	(0.017)	(0.003)	(0.003)
Q_{ann}^{T}	-0.004	0.024*	0.010***	0.012***
	(0.013)	(0.014)	(0.003)	(0.004)
Log of Relative Size	0.232***	-0.230***	-0.068***	-0.084***
	(0.022)	(0.023)	(0.006)	(0.006)
Log of Target Size	-0.026	0.022	-0.004	-0.007
	(0.019)	(0.018)	(0.005)	(0.006)
Leverage^{B}	-0.303*	0.177	-0.010	-0.224***
	(0.169)	(0.165)	(0.050)	(0.056)
Constant	-4.466***	-0.511	0.946***	1.030***
	(0.310)	(0.975)	(0.084)	(0.085)
Industry FEs	✓	✓	✓	✓
Year Effects	✓	✓	✓	✓
Specification	Probit	Probit	OLS	OLS
Pseudo R^2	0.191	0.190		
R^2			0.280	0.311
N	3,361	3,377	2,984	2,870

Table 5: Pricing of Mergers and Acquisitions

This table reports the result of regressions that examine the relationship between the pricing of target firms and NRV_{ann}. The dependent variable is *Offer Premium* in Panel A, and $Log(P^T_{offer}/P^T_{52\ High})$ in Panel B. In both these panels, we first estimate the regression for all deals in columns (1) and (2), and then separately for all-cash deals and stock deals in columns (3) and (4), respectively. We examine stock deals only in Panel C, where the dependent variable is $Log(\frac{ER}{P^T_{ann}/P^B_{ann}})$ in columns (1) and (2), and $Log(ER/ER_{52High})$ in columns (3) and (4). We include bidder industry fixed-effects and year dummies in all specifications. All the variables are defined in the Appendix. Standard errors reported in parentheses are robust to heteroskedasticity and are clustered at the level of the bidding firm. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) level.

Panel A. Offer Premium and NRV_{ann}

Dependent Variable:	Offer Premium			
Samples Inluded:	All Deals		*All Cash* = 1	*Stock* = 1
	(1)	(2)	(3)	(4)
NRV_{ann}	0.165***	0.164***	0.064*	0.210***
	(0.022)	(0.022)	(0.036)	(0.031)
RRV^B_{OV}		-0.017*		
		(0.010)		
RRV^T_{OV}		-0.011		
		(0.014)		
σ^{RV}	-0.000**	-0.001***	-0.000	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Target 52 High	0.045**	0.036*	0.153***	0.031
	(0.019)	(0.020)	(0.036)	(0.023)
Log of Relative Size	0.037***	0.039***	0.035***	0.039***
	(0.005)	(0.005)	(0.007)	(0.008)
Log of Target Size	-0.011**	-0.007	-0.015**	-0.008
	(0.004)	(0.005)	(0.007)	(0.007)
Q^B_{ann}	-0.001	0.002	-0.009***	0.001
	(0.002)	(0.003)	(0.003)	(0.003)
Q^T_{ann}	0.001	0.003	-0.001	0.001
	(0.003)	(0.003)	(0.003)	(0.004)
Leverage^B	-0.038	-0.001	-0.060	-0.044
	(0.034)	(0.043)	(0.053)	(0.052)
Constant	0.378***	0.344***	0.454***	0.200
	(0.057)	(0.063)	(0.083)	(0.190)
Industry FEs	✓	✓	✓	✓
Year Effects	✓	✓	✓	✓
Specification	OLS	OLS	OLS	OLS
R^2	0.162	0.165	0.282	0.168
N	2,239	2,144	715	1,287

Panel B. $Log(P^T_{offer}/P^T_{52\ High})$ and NRV_{ann}

Dependent Variable:	$Log(P^T_{offer}/P^T_{52\ High})$			
Samples Inluded:	All Deals		$All\ Cash = 1$	$Stock = 1$
	(1)	(2)	(3)	(4)
NRV_{ann}	-0.289***	-0.275***	-0.330***	-0.240***
	(0.035)	(0.034)	(0.047)	(0.054)
RRV^B_{OV}		0.001		
		(0.017)		
RRV^T_{OV}		0.151***		
		(0.023)		
σ^{RV}	-0.001***	-0.001***	-0.001**	-0.001*
	(0.000)	(0.000)	(0.001)	(0.000)
Log of Relative Size	0.045***	0.041***	0.004	0.055***
	(0.009)	(0.009)	(0.010)	(0.015)
Log of Target Size	0.067***	0.046***	0.014	0.097***
	(0.008)	(0.008)	(0.010)	(0.011)
Q^B_{ann}	0.005	0.005	-0.004	0.009*
	(0.004)	(0.005)	(0.007)	(0.005)
Q^T_{ann}	0.008**	-0.019***	0.004	0.009
	(0.004)	(0.005)	(0.005)	(0.006)
Leverage^B	0.219***	0.185**	0.171**	0.264***
	(0.063)	(0.075)	(0.081)	(0.093)
Constant	0.123	0.348***	0.409***	-0.573***
	(0.090)	(0.104)	(0.120)	(0.188)
Industry FEs	✓	✓	✓	✓
Year Effects	✓	✓	✓	✓
Specification	OLS	OLS	OLS	OLS
R^2	0.262	0.297	0.319	0.308
N	2,239	2,144	715	1,287

Panel C. Exchange Ratios and NRV_{ann}

Dependent Variable:	$Log(\frac{ER}{P^T_{ann}/P^B_{ann}})$		$Log(ER/ER_{52High})$	
	(1)	(2)	(3)	(4)
NRV_{ann}	0.224***	0.224***	-1.649***	-1.631***
	(0.080)	(0.085)	(0.152)	(0.155)
RRV^B_{OV}		-0.052		-0.160*
		(0.047)		(0.089)
RRV^T_{OV}		-0.076*		0.083
		(0.045)		(0.084)
Target 52 High	0.138***	0.095**		
	(0.045)	(0.046)		
σ^{RV}	-0.001	-0.001	-0.001	-0.000
	(0.000)	(0.001)	(0.001)	(0.001)
Log of Relative Size	0.119***	0.129***	1.496***	1.517***
	(0.022)	(0.023)	(0.039)	(0.039)
Log of Target Size	0.018	0.036*	0.286***	0.296***
	(0.019)	(0.021)	(0.029)	(0.031)
Q^B_{ann}	0.021**	0.028**	-0.018	-0.000
	(0.009)	(0.011)	(0.012)	(0.015)
Q^T_{ann}	-0.025***	-0.016	0.020	0.007
	(0.008)	(0.010)	(0.017)	(0.020)
Leverage^B	-0.172	-0.092	0.126	0.141
	(0.120)	(0.142)	(0.286)	(0.322)
Constant	1.685***	1.095***	-5.839***	-3.919***
	(0.427)	(0.213)	(0.343)	(0.365)
Industry FEs	✓	✓	✓	✓
Year Effects	✓	✓	✓	✓
Specification	OLS	OLS	OLS	OLS
R^2	0.181	0.189	0.632	0.645
N	1,445	1,390	1,445	1,390

Table 6: Announcement Returns and M&A Announcement Timing

This table reports the results of OLS regressions that examine the relationship between short-term announcement returns and NRV_{ann}. The dependent variable is *Bidder* $CAR[-1,+1]$ in Panel A, *Target* $CAR[-1,+1]$ in Panel B, and *Combined* $CAR[-1,+1]$ in Panel C. In each panel, we first estimate the regression for all deals in columns (1) and (2), and then separately for all-cash deals and stock deals in columns (3) and (4), respectively. In Panels A and C, we include bidder industry fixed-effects and year dummies in all columns. In Panel B, we include target industry fixed-effects and year dummies in all columns. All the variables are defined in the Appendix. Standard errors reported in parentheses are robust to heteroskedasticity and are clustered at the firm level. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) level.

Panel A. Bidder $CAR[-1,+1]$ and NRV_{ann}

Dependent Variable:	Bidder $CAR[-1,+1]$			
Samples Included:	All Deals		*All Cash* = 1	*Stock* = 1
	(1)	(2)	(3)	(4)
NRV_{ann}	-0.018***	-0.020***	0.001	-0.021***
	(0.005)	(0.005)	(0.009)	(0.008)
RRV^B_{OV}		-0.004*		
		(0.002)		
RRV^T_{OV}		-0.002		
		(0.003)		
σ^{RV}	-0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Q^B_{ann}	-0.002**	-0.001	0.000	-0.002**
	(0.001)	(0.001)	(0.002)	(0.001)
Q^T_{ann}	0.000	0.000	-0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Log of Relative Size	0.001	0.002	-0.009***	0.003
	(0.002)	(0.002)	(0.003)	(0.002)
Log of Target Size	-0.005***	-0.005***	-0.009***	-0.004***
	(0.001)	(0.001)	(0.002)	(0.001)
Leverage^B	0.018	0.013	0.024	0.008
	(0.012)	(0.013)	(0.025)	(0.014)
Constant	-0.000	0.027**	0.030	0.011
	(0.025)	(0.012)	(0.032)	(0.022)
Industry FEs	✓	✓	✓	✓
Year Effects	✓	✓	✓	✓
Specification	OLS	OLS	OLS	OLS
R^2	0.081	0.079	0.147	0.092
N	3,383	3,242	1,042	1,942

Panel B. Target $CAR[-1,+1]$ and NRV_{ann}

Dependent Variable:	Target $CAR[-1,+1]$			
Samples Included:	All Deals		*All Cash* = 1	*Stock* = 1
	(1)	(2)	(3)	(4)
NRV_{ann}	0.093***	0.095***	0.100***	0.096***
	(0.014)	(0.014)	(0.029)	(0.017)
RRV_{OV}^{B}		-0.029***		
		(0.007)		
RRV_{OV}^{T}		-0.024**		
		(0.010)		
σ^{RV}	-0.000**	-0.000*	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Q_{ann}^{B}	-0.004**	0.000	-0.020***	0.001
	(0.002)	(0.002)	(0.005)	(0.002)
Q_{ann}^{T}	-0.009***	-0.004	-0.010***	-0.007**
	(0.002)	(0.003)	(0.004)	(0.003)
Log of Relative Size	0.047***	0.053***	0.048***	0.050***
	(0.004)	(0.004)	(0.008)	(0.005)
Log of Target Size	0.000	0.006*	-0.000	-0.001
	(0.003)	(0.003)	(0.007)	(0.004)
Leverage^{B}	-0.024	0.027	-0.110*	0.001
	(0.027)	(0.029)	(0.062)	(0.035)
Constant	-0.202**	-0.252***	0.027	-0.353***
	(0.102)	(0.096)	(0.072)	(0.048)
Industry FEs	✓	✓	✓	✓
Year Effects	✓	✓	✓	✓
Specification	OLS	OLS	OLS	OLS
R^2	0.147	0.164	0.174	0.179
N	3,383	3,242	1,042	1,942

Panel C. Combined $CAR[-1,+1]$ and NRV_{ann}

Dependent Variable:	Combined $CAR[-1,+1]$			
Samples Included:	All Deals		$All\ Cash = 1$	$Stock = 1$
	(1)	(2)	(3)	(4)
NRV_{ann}	-0.000	0.002	0.005	0.006
	(0.005)	(0.005)	(0.008)	(0.007)
RRV_{OV}^{B}		-0.015***		
		(0.003)		
RRV_{OV}^{T}		-0.001		
		(0.003)		
σ^{RV}	-0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Q_{ann}^{B}	-0.002***	0.001	-0.002	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Q_{ann}^{T}	-0.001*	-0.001	-0.001	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Log of Relative Size	-0.013***	-0.010***	-0.024***	-0.007***
	(0.001)	(0.001)	(0.002)	(0.002)
Log of Target Size	-0.002**	-0.001	-0.005***	-0.001
	(0.001)	(0.001)	(0.002)	(0.001)
Leverage^{B}	0.017	0.031***	0.017	0.012
	(0.010)	(0.011)	(0.016)	(0.014)
Constant	-0.031	-0.012	0.036	-0.014
	(0.025)	(0.013)	(0.045)	(0.016)
Industry FEs	✓	✓	✓	✓
Year Effects	✓	✓	✓	✓
Specification	OLS	OLS	OLS	OLS
R^2	0.120	0.135	0.330	0.105
N	3,383	3,242	1,042	1,942

Table 7: Success of Mergers and Acquisitions

This table reports the result of Probit regressions that examine the relationship between deal failure and NRV_{ann}. The dependent variable in column (1) is *Failed*, which is a dummy variable that identifies deals that fail to be completed. The dependent variable in columns (2) and (3) is *Failed due to Target's Refusal*, which is a dummy variable that identifies deals that fail to be completed due to the target firm's refusal. We include bidder industry fixed-effects and year dummies in all columns. All the variables are defined in the Appendix. Standard errors reported in parentheses are robust to heteroskedasticity and are clustered at the level of the bidding firm. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) level.

Dependent Variable:	Failed	Failed due to Target's Refusal	
	(1)	(2)	(3)
NRV_{ann}	0.223**	0.616***	0.528***
	(0.092)	(0.139)	(0.145)
RRV_{OV}^{B}			0.182***
			(0.048)
RRV_{OV}^{T}			-0.261***
			(0.087)
σ^{RV}	0.000	0.000	-0.000
	(0.001)	(0.001)	(0.001)
Q_{ann}^{B}	0.020**	0.009	-0.024
	(0.010)	(0.014)	(0.018)
Q_{ann}^{T}	-0.020	-0.025	0.017
	(0.015)	(0.031)	(0.035)
Log of Relative Size	-0.194***	-0.198***	-0.233***
	(0.021)	(0.032)	(0.036)
Log of Target Size	-0.091***	-0.027	0.002
	(0.018)	(0.026)	(0.029)
Leverage^{B}	0.152	-0.138	-0.353
	(0.163)	(0.238)	(0.283)
Constant	-4.164***	-4.227***	-4.492***
	(0.299)	(0.407)	(0.445)
Industry FE	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes
Industry FEs	✓	✓	✓
Year Effects	✓	✓	✓
Specification	Probit	Probit	Probit
Pseudo R^2	0.077	0.111	0.132
N	3,351	3,171	3,031

Table 8: Long-term Shareholder Returns and M&A Announcement Timing

This table reports the results of tests that examine the relationship between bidders' long-run abnormal return and NRV_{ann}. We measure long-run abnormal return using three different methods: buy-and-hold abnormal return using a matched-portfolio approach ($BHAR_{Matched\ Portfolio}$); buy-and-hold abnormal return using a matched-firm approach ($BHAR_{Matched\ Firm}$); and calendar-time portfolio α.
In Panels A and B, we examine how the bidder's long-run abnormal return over the period from the month of deal announcement to 12 months after announcement varies with NRV_{ann} and success or failure of the deal. Panel A presents the univariate analysis whereas Panel B presents the multivariate analysis. In Panel A, we define the dummy variable "High NRV_{ann}" ("Low NRV_{ann}") to identify deals with NRV_{ann} greater than or equal to (lower than) the sample average, and the dummy variable "Exogenous Failure" to identify deals that failed due to regulatory issues or competing bidders. The dependent variable in Panel C is the bidder's long-run abnormal return over the period from the month of private initiation of discussions to 12 months after deal announcement. We include bidder industry fixed effects and year dummies in all regressions. Standard errors reported in parentheses are robust to heteroskedasticity and are clustered at the level of the bidding firm. Asterisks denote significance at the 1% (***), 5% (**), and 10% (*) level.

Panel A. Univariate tests

	Successful (S)	Exogenously Failed (EF)	S − EF
$BHAR_{Matched\ Portfolio}[0M, +12M]$			
High NRV_{ann} (H)	-0.050***	-0.183***	0.132**
	(0.013)	(0.052)	(0.058)
Low NRV_{ann} (L)	-0.008	-0.010	0.003
	(0.013)	(0.048)	(0.057)
(H) − (L)	-0.042**	-0.172**	
	(0.018)	(0.071)	
$BHAR_{Matched\ Firm}[0M, +12M]$			
High NRV_{ann} (H)	-0.047***	-0.223***	0.176**
	(0.017)	(0.065)	(0.077)
Low NRV_{ann} (L)	-0.002	0.051	-0.053
	(0.017)	(0.070)	(0.076)
(H) − (L)	-0.045**	-0.274***	
	(0.025)	(0.096)	
Calendar-time Portfolio α $[0M, +12M]$ (%, Monthly)			
High NRV_{ann} (H)	-0.453***	-1.550***	1.468***
	(0.141)	(0.423)	(0.456)
Low NRV_{ann} (L)	-0.064	-0.390	0.395
	(0.123)	(0.341)	(0.383)
(H) − (L)	-0.330**	-1.033*	
	(0.138)	(0.582)	

Panel B. Regression of $BHAR[0M, +12M]$ on NRV_{ann}

Dependent Variable:	$BHAR_{Matched\ Portfolio}[0M, +12M]$			$BHAR_{Matched\ Firm}[0M, +12M]$		
	(1)	(2)	(3)	(4)	(5)	(6)
NRV_{ann}	-0.061**	-0.055*	-0.065**	-0.079**	-0.067*	-0.103**
	(0.028)	(0.029)	(0.030)	(0.039)	(0.039)	(0.040)
$NRV_{ann}\times$ Exogenous Failure		-0.145			-0.306	
		(0.131)			(0.202)	
Exogenous Failure		0.013			0.101	
		(0.080)			(0.130)	
RRV_{OV}^{B}			-0.023			-0.006
			(0.015)			(0.019)
RRV_{OV}^{T}			-0.025			-0.040*
			(0.018)			(0.023)
σ^{RV}	-0.001*	-0.001*	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Q_{ann}^{B}	-0.005	-0.005	0.002	-0.008	-0.008	-0.004
	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.007)
Q_{ann}^{T}	-0.004	-0.004	-0.001	-0.001	-0.001	0.004
	(0.004)	(0.004)	(0.006)	(0.005)	(0.005)	(0.007)
Log of Relative Size	0.012*	0.012*	0.015**	0.011	0.011	0.015
	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.010)
Log of Target Size	0.003	0.004	0.006	0.002	0.003	0.010
	(0.005)	(0.005)	(0.007)	(0.007)	(0.007)	(0.009)
Leverage^{B}	-0.005	-0.005	0.008	0.033	0.033	0.021
	(0.057)	(0.057)	(0.073)	(0.073)	(0.073)	(0.093)
Constant	-0.017	-0.020	0.713***	-0.001	-0.009	0.259**
	(0.045)	(0.045)	(0.076)	(0.061)	(0.061)	(0.101)
Industry FEs			✓			✓
Year Effects			✓			✓
R^2	0.004	0.005	0.036	0.006	0.007	0.043
N	3,378	3,378	3,237	3,378	3,378	3,237

Panel C. Regression of $BHAR[init, +12M]$ on NRV_{ann}

Dependent Variable:	$BHAR_{Matched\ Portfolio}[init, +12M]$		$BHAR_{Matched\ Firm}[init, +12M]$	
	(1)	(2)	(3)	(4)
NRV_{ann}	0.161**	0.145**	0.163**	0.196**
	(0.063)	(0.072)	(0.080)	(0.096)
RRV_{OV}^{B}		0.049		-0.000
		(0.037)		(0.049)
RRV_{OV}^{T}		-0.063		-0.020
		(0.039)		(0.050)
σ^{RV}	-0.000	-0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
Q_{ann}^{B}	0.002	-0.002	0.000	0.003
	(0.007)	(0.010)	(0.009)	(0.013)
Q_{ann}^{T}	0.019**	0.028**	0.030***	0.035**
	(0.009)	(0.013)	(0.010)	(0.015)
Log of Relative Size	0.012	-0.004	0.017	0.004
	(0.016)	(0.018)	(0.020)	(0.023)
Log of Target Size	-0.003	-0.004	-0.017	-0.023
	(0.012)	(0.014)	(0.016)	(0.018)
Leverage^{B}	0.152	0.031	0.127	0.001
	(0.118)	(0.157)	(0.138)	(0.191)
Constant	-0.187*	0.063	-0.139	-0.010
	(0.106)	(0.175)	(0.139)	(0.242)
Industry FEs		✓		✓
Year Effects		✓		✓
R^2	0.017	0.081	0.016	0.064
N	1,028	983	1,028	983