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Security analyst target prices as reference point and takeover completion

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ABSTRACT

Based on prospect theory, we posit that security analysts' target prices function as a reference point for takeover bids and affect deal completion. Using a sample of US takeovers from 1999 to 2014, we find a negative relation between target prices for a takeover target and the chances for successful deal completion. High degrees of target price dispersion indicate high reference points for some investors. Accordingly, we find low completion rates when target price dispersion is high. Our results hold for both ultimate deal completion and implied completion probability measured shortly after bids were announced as an alternative measure for completion likelihood.

1. Introduction

In corporate mergers and acquisitions,[1] the acquiring company usually offers a premium on top of the target company's share price, because target shareholders are unlikely to accept a bid for their shares which is lower than or equal to the prevailing market price.[2] Nevertheless, not all attempted takeovers lead to successfully completed takeover offers. Bid prices play a prominent role in the acceptance of takeover bids (e.g., Walkling, 1985; Holl and Kyriazis, 1996; Baker et al., 2012; Malmendier et al., 2016).[3]

The perception of the adequacy of an offer can be important in merger negotiations, because "valuing a company is subjective [...and ...] real-life considerations mean the appropriate target price cannot be set with precision" (Baker et al., 2012: 49). The absence of indisputable takeover prices allows for the emergence of psychologically rooted decisions by the takeover target's board and its shareholders. Prospect theory (Kahneman and Tversky, 1979) suggests that the utility derived from transactions also depends on the difference between the realized price and a reference point. The reference point results from an anchoring-and-adjustment process (Tversky and Kahneman, 1974), which means that investors use initially available information which they adjust based on new information. However, these adjustments are usually relatively small, resulting in a relatively high importance of the initial 'anchor'. For individual investors, the purchasing price of their shares may function as a reference point, but other prices can function as reference points as well. For example, Baker et al. (2012) reported that recent high stock prices can act as a reference point in takeover bids.

In this paper, we propose that security analysts' stock price expectations (i.e., target prices) can also function as a reference point for shareholders of a target company. A target price is an analyst's estimate of the price level that a stock is expected to reach within – usually – 12 months. Target prices are widely available to

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[1] Despite different definitions, we follow the convention in the M&A literature and use the terms 'mergers', 'acquisitions', and 'takeovers' interchangeably.

[2] For an exception to this rule, see Weitzel and Kling (2014).

[3] An example of a deal in which the bid was deemed to be to low is the $16.4 bln takeover bid by US-based Kraft for the UK company Cadbury in November 2009. Cadbury's chairman stated in his recommendation to the targeted shareholders that "*Kraft's offer fails to recognize the value we have built in your company*". The initial offer was rejected by the management. A subsequent offer of $18.9 bln was accepted in January 2010. (The full statement can be accessed on http://online.wsj.com/public/resources/documents/CadburyDefenceDocument2009-part1.pdf.)

http://dx.doi.org/10.1016/j.jbef.2017.07.004
2214-6350/

investors and are freely available via numerous investor websites such as Yahoo Finance. In addition to the availability, target prices are perceived to be useful. For example, the designated investor website Investopedia referred to them as "the key to sound investing" (Wayman, n.d.). Accordingly, revisions of target prices by analysts are associated with short-term abnormal stock returns (e.g., Brav and Lehavy, 2003; Asquith et al., 2005; Kerl and Walter, 2008). Target shareholders may resort to these expert opinions in forming their opinion on a takeover bid, because they may not have the resources available to conduct a discounted cash flow analysis themselves. Given the broad exposure of investors to target price publications, we argue, analogously to Baker et al. (2012), that these price expectations have an impact along the lines of prospect theory and reference points.

We expect that takeover bids will be consummated less frequently when a bid price is below analyst target prices if investors use the latter as a reference point for the stand-alone value of the target firm. Conversely, when a bid exceeds analyst target prices, we expect investors to be more willing to sell their shares and complete the merger. In addition to the average level of analyst target prices, the divergence of these prices may also play a role. Strong divergence of analyst target prices may indicate that at least some shareholders of the target company have a high reference point.[4] On a related note, Chatterjee et al. (2012) found a positive relationship between analysts' opinion divergence and takeover premiums. We extend this argument to takeover completion and expect that deal consummation will be lower for higher levels of opinion divergence, because a given bid is more likely to be rejected by a larger number of target shareholders who have a high reference point.

In our analyses, we studied the ultimate outcome of a bid (i.e., completed or withdrawn) as well as the market's initial estimate of the completion likelihood of a bid. The main reason for studying the initial estimate in addition to the ultimate outcome is that the impact of potential confounding effects is lower. As several months might pass from the takeover announcement to its resolution, eventual completion may be influenced by, for example, adverse market conditions. These confounding effects are isolated when evaluating the market's initial response. We evaluated the initial estimate by studying the bid price, the market response to the bid, and the pre-bid stock price. Brown and Raymond (1986) developed a simple model using the bid price, the stock price prior to the bid, and the market response to the bid, from which a "prediction as to the eventual success of the merger can be inferred" (Brown and Raymond, 1986: 55). We found a positive relation between the relative bid premium (defined as the bid price in excess of the analysts' average target price, both scaled by the stock price) and the probability of merger completion. This suggests that investors are more willing to sell their shares to an acquirer when a bid exceeds target prices as published by security analysts as their presumed reference point. Furthermore, consistent with our expectations, a high measure of divergence between analyst forecasts about the future share price was associated with lower takeover completion rates. Our results are consistent across both measures for takeover completion (i.e., implied completion likelihood and ultimate deal completion).

Our study contributes to and complements the literature on (i) the use of reference points in stock markets, and (ii) analyst forecasts for takeover targets. Our study is connected to a rich literature on prospect theory (e.g., Kahneman and Tversky, 1979) and the anchoring-and-adjustment approach (e.g., Tversky and Kahneman, 1974). In a previous study on takeovers, Baker et al. (2012) showed the importance of historical share price highs as reference points for both deal completion and the level of the takeover bid. Gerritsen (2015) found a positive relation between target prices and takeover bids, but did not study deal completion. Other studies linking security analyst opinions to takeovers predominantly focused on the relevance of analyst opinions which were published *after* a bid was announced. Pound (1988), Brous and Kini (1993) and Sudarsanam et al. (2002) all evaluated revised earnings forecasts for the stand-alone target company in response to a takeover announcement. Becher et al. (2015) studied the relation between analyst recommendations after merger announcements and takeover completion. In contrast, Bradley et al. (2007) studied *ex ante* recommendation levels of tender offer targets and compared these to a broader universe of stocks of non-target companies. They found that analysts *a priori* did not publish higher recommendation levels for companies that were to be acquired, and thus seemed to be unable to identify future takeover targets through their recommendations. Our study is different from Bradley et al. (2007) in that we solely focus on a subsample of targeted companies with announced takeover bids. Within this subsample, we relate analyst opinions to eventual merger consummation. Chatterjee et al. (2012) related analysts' opinion divergence regarding the target company to takeover premiums. They showed that if there is high opinion divergence among analysts prior to the merger announcement, shareholders expect and receive higher takeover offers from interested parties. Our study complements and advances Chatterjee et al.'s (2012) insights into takeover likelihood and premiums by focusing on the effects of analyst opinions on takeover completion.

For the practitioner, this paper adds to the understanding why some takeover attempts fail while others are successful. Importantly, we provide novel indicators for completion likelihood, which may be useful in structuring future takeover offers. Moreover, our results imply that analyst target prices can be interpreted as a very practical benchmark that needs to be surpassed for a bid to be successful.

The paper is structured as follows. After the development of hypotheses in the Section 2, the data and methodology are described in Section 3. Section 4 presents the results and robustness checks. Section 5 provides a discussion and conclusion.

2. Development of hypotheses

2.1. Target price implied expected returns

Security analysts analyze public companies with respect to current and future profitability. They compare the resulting theoretical stock value with current market valuations and publish, among others, a so-called target price. The literature has shown that the publication of target prices has an impact on stock prices. Among others, Brav and Lehavy (2003) documented short-term abnormal returns around target price revisions. The magnitude of these returns was positively associated with the favorableness of the revision. Target price revisions are widely disseminated and known across the investment community. In line with previous studies on takeovers and prospect theory (e.g. Baker et al., 2012), we therefore argue that target prices are well-known public information that can function as a reference point for investors when deciding on accepting takeover bids.

Anecdotal evidence supports our presumption that analyst target prices are related to the reception of the bid by the takeover target company. For example, Lions Gate Entertainment rejected a takeover bid by Carl Icahn in March 2010. Although the bid price of $6.00 per share was nearly 15% above the share price of $5.23 at that time, the bid undervalued the company according to target management, given that the "average price target of analysts is

[4] In support of this rationale, we found a strong positive correlation between the median target price and the opinion divergence of the target price.

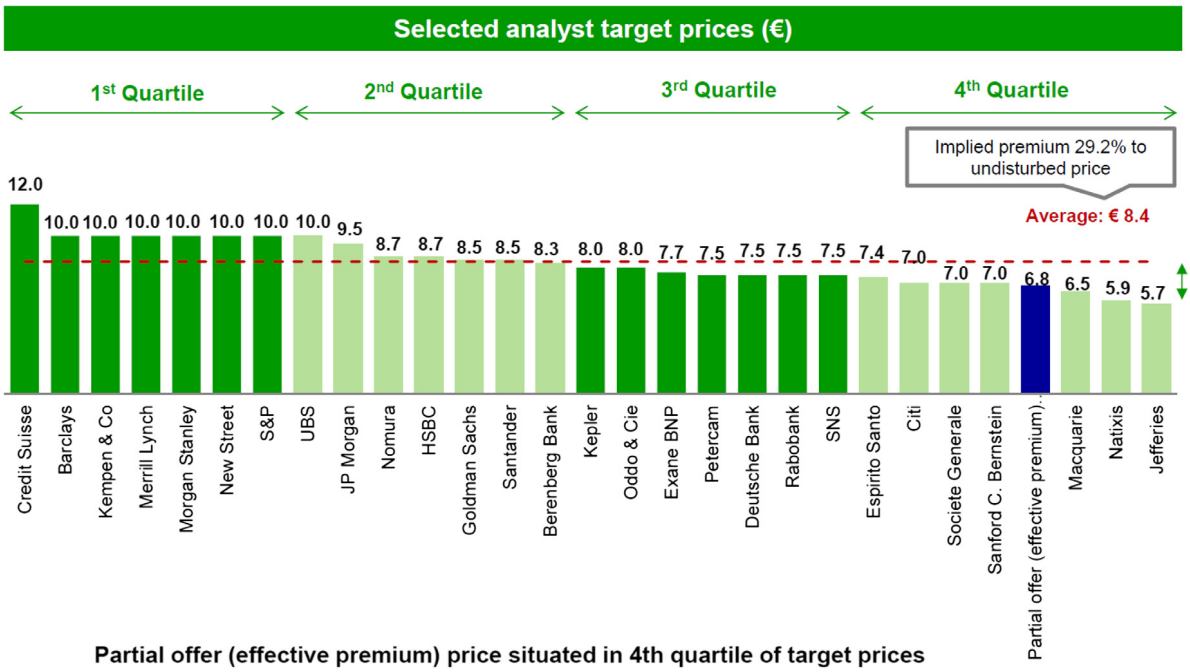

Fig. 1. Example of a comparison of a takeover bid to outstanding target prices. Slide from KPN presentation to shareholders, titled for KPN", 1 June 2012.

$8.67" (www.nydailynews.com, March 19, 2010). Another example is provided in Fig. 1. This figure depicts a graph from a presentation by the management board of the Dutch telecom operator KPN in response to a (partial) takeover bid by América Móvil. KPN's board compared the offered price to analysts' outstanding target prices and concluded that the offer was too low, given that the bid price was situated in the lowest quartile (and well below the average) of analyst target prices.

Following this anecdotal evidence, and based on prospect theory (e.g., Tversky and Kahneman, 1974; Kahneman and Tversky, 1979), we suggest that shareholders of a takeover target use the average outstanding target price[5] by analysts as reference point to accept or reject a bid of an acquirer. If the target price acts as a reference point, then prospect theory (Kahneman and Tversky, 1979) suggests that investors are reluctant to tender their shares for a value that is lower than their reference point. Even if investors update their beliefs after a bid, anchoring-and-adjustment theory (Tversky and Kahneman, 1974) suggests that this updating is insufficient, because investors tend to stay too close to their initial beliefs.

The main rationale and terminology is summarized in Fig. 2. This figure depicts prospect theory, including the S-shaped value function. The horizontal axis depicts the bid relative to the target price (i.e., the reference point), both normalized by the pre-bid share price. In the remainder of the paper, we refer to this as the relative bid premium. If the bid exceeds the target price, the investor is at the right hand side of the graph, if not, investors end up at the left hand side. The value an investor derives from a certain offer is depicted by the S-shaped curve. Typically, offers above the reference point (i.e., Offer A in Fig. 2) lead to positive utility and would hence increase the chance that investors sell shares to an acquirer. Prospect theory stipulates that investors perceive bids under the reference point (i.e., Offer B) as losses, and they are as a result generally less willing to sell their shares to the acquirer. Hence, the chance that they will offer their shares to the acquirer is lower when the bid is below the target price. Since the bid price itself is shown to affect the completion likelihood (e.g., Walkling, 1985; Holl and Kyriazis, 1996), we control for this variable in all our estimations. This brings us to our first hypothesis.

*H*1: The likelihood of takeover completion is positively associated with the difference between the bid premium and the average target price issued by analysts, both normalized with the pre-bid share price.

2.2. Divergence of target prices

The preceding discussion centered on the average target price. However, these averages might be based on a distribution of highly dispersed target prices.[6] For a given bid, the rationale of our first hypothesis can be extended to opinion divergence. In times of high dispersion, some shareholders have a higher reference point. A given bid in a more dispersed universe of target prices as reference points is therefore less likely to convince all shareholders of the target company to give up their shares. We therefore expect that opinion divergence (measured as the standard deviation of the average published analyst target price) is negatively related to merger completion.

Chatterjee et al. (2012) connected opinion dispersion concerning target companies to takeover bids.[7] They found that takeover premiums and opinion divergence are positively related. Chatterjee et al. (2012) tested their hypothesis on different samples. Their main sample contained completed mergers only, while a

[5] Investors mostly refer to the average target price. Our results are robust to using the maximum target price (unreported). This is not surprising, given the strong correlation between the maximum target price and the average target price ($\rho = 0.83$). In our robustness checks, we touch upon estimated results based on the median target price.

[6] There is a large body of literature on opinion dispersion (see, e.g., Doukas et al., 2006, for a detailed overview). This literature, however, primarily studies asset pricing and does not focus on takeovers or deal completions.

[7] On a related note, Alexandridis et al. (2007) and Moeller et al. (2007) related acquirer returns to opinion divergence regarding the acquiring company. Alexandridis et al. (2007) found that acquirers subject to high opinion divergence underperform after acquisitions. Moeller et al. (2007) documented that this underperformance only holds for acquisition of public firms in which the acquirer faces a high divergence of opinion.

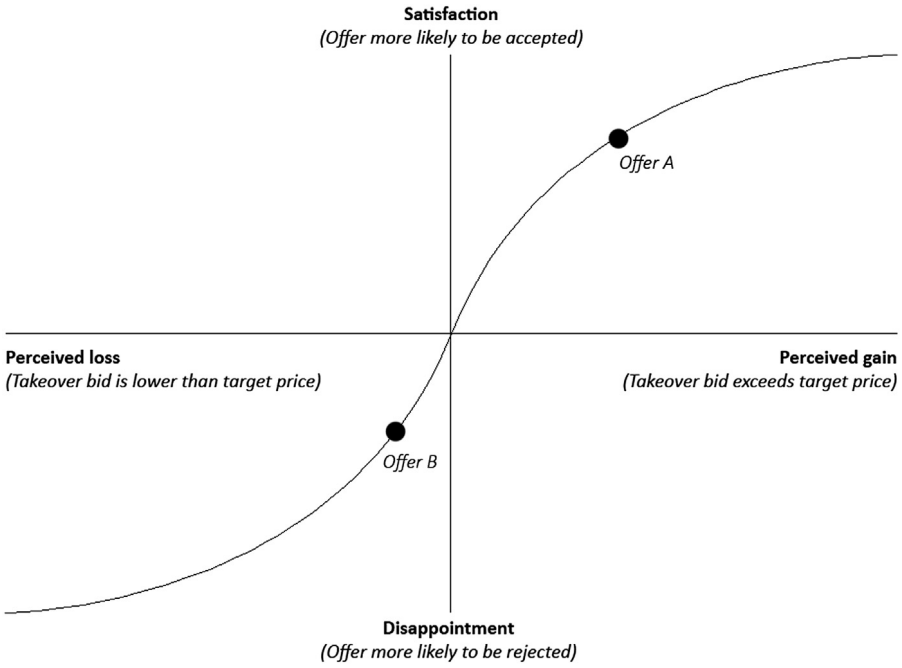

Fig. 2. Prospect theory applied to offer acceptance.

robustness check was performed on a sample containing both completed and withdrawn mergers. They did not, however, address any factors which might explain differences between completed and non-completed takeover attempts. We posit that when takeover targets are subject to a high level of target price dispersion, the chance that all shareholders are convinced to sell their shares to the acquirer is lower. Hence, we formulate our second hypothesis as follows:

H2: The dispersion rate of security analyst target prices is negatively related to the probability of takeover completion.

3. Data and methodology

3.1. Data and sample selection

We used the Thomson Reuters SDC database to identify acquisition announcements which we subsequently matched with target prices obtained from the Institutional Brokers' Estimate System ($I/B/E/S$). Our sample period starts in March 1999 as that is the starting date of the $I/B/E/S$ target price database. We downloaded SDC data in August 2015, where we included completed and withdrawn merger offers announced up to and including 2014 in which the bidder owned less than 50% of the target shares prior to the bid and seeks to own at least 50% of the shares after the bid (e.g., Betton et al., 2008; Baker et al., 2012). In case of consecutive bids for the same target company, we considered only the first offer for a target company. To avoid currency problems, we considered US dollar-denominated deals only, and we further required both bidder and target to originate from the United States. Moreover, the target must be publicly listed and must have an available share price, bid price, and target price. We used Datastream to check for consistency in quoted prices across SDC and $I/B/E/S$.[8] We excluded penny stocks (i.e., stocks with a stock price lower than $1) and deals where the market value of the target company four weeks prior to the takeover bid was smaller than $100 million. Finally, we required complete information on the method of payment. As a consequence, we identified 1567 deals in our sample. In addition, each case was required to have at least two target prices, as we needed to be able to measure target price dispersion.[9] Our main sample of takeovers therefore consists of 1311 deals.

3.2. Variables

Dependent variables

We used two different dependent variables to measure deal completion. First, we considered the ultimate completion status of an announced takeover attempt as reported by SDC. SDC keeps a record of the status of each announced deal and whether it was completed or withdrawn. We computed a dummy variable (*COMPLETED*) that took the value of '1' when a merger was completed and '0' when a merger was withdrawn. In addition, we studied the implied completion likelihood (*IMPLIED*) as in, e.g., Brown and Raymond (1986) or Samuelson and Rosenthal (1986). The implied completion probability reflects the market's immediate assessment of the chances of successful completion. Therefore, this measure is unaffected by events occurring during the period between deal announcement and resolution. *IMPLIED* is based on the bid $\left(P_{B,i,t}\right)$, on the market response to a bid right after the announcement $\left(P_{i,t+1}\right)$, and on the fallback price in case the bid is unsuccessful $\left(P_{F,i}\right)$. The distance between the bid and the post-bid stock price is commonly referred to as arbitrage spread (e.g., Jetley and Ji, 2010). In general, the closer the stock price is to the bid price, the higher the likelihood of a successful takeover bid. To illustrate the computation of *IMPLIED*, we compare two fictional takeover targets i and j . Stock prices of both firms increase to $10 after both firms received a takeover bid of $11.00. Hence, the arbitrage spread $(\frac{P_{B,i,t}}{P_{i,t+1}} - 1)$ is 10%. This 10% spread can be earned by arbitrageurs who purchase target shares after the bid announcement

[8] After checking both adjusted and unadjusted stock prices and target prices across Datastream and $I/B/E/S$ respectively, we encountered 34 target companies for which we could not match analyst target prices to a stock price. A possible reasons is a different treatment of stock splits. We excluded these cases in our final sample. For the sake or robustness (unreported), we conducted all tests while including these 34 cases. Our results were robust to this inclusion.

[9] This exclusion does not qualitatively influence our findings. We will address this issue in the robustness checks.

and sell them to the acquirer for $11.00 when the offer is declared unconditional. However, the fallback price in case of unsuccessful bids is relevant as well. In case the takeover attempt turns out to be unsuccessful, stocks of firm i are expected to drop to $6, whereas stocks j are expected to decrease to $8. In other words, investors in i can earn $1.00 or lose $4.00. For the investment to make sense, assuming risk-neutrality, the takeover must have a chance of 80% to succeed ($0.8 * \$1 = 0.2 * \$4$). For stocks j, investors either earn $1.00 or lose $2.00. The breakeven probability in this case is 66.7%. More formally, the implied completion probability (*IMPLIED*) equals:

$$IMPLIED = \frac{P_{i,t+1} - P_{F,i}}{P_{B,i,t} - P_{F,i}}. \quad (1)$$

In this equation, $P_{i,t+1}$ refers to the closing stock price of takeover target i 1 day after the bid announcement at time t ; $P_{B,i,t}$ refers to the takeover bid for target i at time t ; and $P_{F,i}$ is the fallback price of firm i in case the offer turns out to be unsuccessful. Some takeover bids might induce follow-up bids by either competing bidders or the acquirer itself. The anticipation by investors of competing offers might lead to a negative arbitrage spread (i.e., $P_{B,i,t} < P_{i,t+1}$) and this would result in an implied completion probability of larger than 1. These instances merely imply that the market anticipates a competing offer, rather than that investors expect the current offer to be successful. Accordingly, Samuelson and Rosenthal (1986) excluded offers with competing bids when computing implied takeover probabilities. We followed Samuelson and Rosenthal (1986) by restricting our *IMPLIED*-sample to non-competing takeover bids only. Additionally, we excluded (i) bids resulting in negative arbitrage spreads (i.e., $\frac{P_{B,i,t}}{P_{i,t+1}} - 1 < 0$) as such spreads reflect the anticipation by investors on a higher bid by either the same or a competing firm; and (ii) bids where either the numerator $P_{i,t+1} - P_{F,i}$ or the denominator $P_{B,i,t} - P_{F,i}$ is smaller than 0 as this ensures that the breakeven probability remains within the [0,1] interval. In computing the fallback value $P_{F,i}$, we followed Brown and Raymond (1986) and used targets' pre-announcement share prices. As share prices can incorporate takeover related information as of, on average, 20 business days prior to the actual announcement (Schwert, 1996), we used the share price four weeks (i.e., 20 business days) prior to the bid.[10] Our *IMPLIED*-sample consists of 924 deals.

Independent variables

We included the following independent variables:

Relative bid premium (*RBP*): This variable measures the difference between the bid premium (*BP*) and the forecasted return by analysts (*TPER*), see Eq. (2).

$$Relative\ Bid\ Premium_{i,t} = BP_{i,t} - TPER_{i,t}. \quad (2)$$

The former term on the right-hand side of Eq. (2) is *BP*. This abbreviation stands for 'bid premium' and was computed as the initial bid price for a share of the target company, divided by the share price of the target company 20 business days prior to the takeover announcement. We selected this cutoff date as Schwert (1996) found that target companies' share prices increase in the period prior to the bid announcement, and that the largest part of this price runup occurs during the last four weeks prior to the offer.[11] Sometimes, several offers were announced consecutively by either the same or other bidders. To exclude confounding effects of this bidding process, we restricted our analysis to the very first bid in a takeover process when computing *BP*. Eq. (3) depicts how *BP* is computed. We winsorized *BP* at the 1st and 99th percentile.

$$BP_{i,t} = \frac{P_{B,i,t}}{P_{i,t-20}} - 1. \quad (3)$$

The latter right-hand side variable in Eq. (2) is *TPER*, which stands for target price implied expected return. *I/B/E/S* publishes target prices issued by analysts. In conjunction with *BP*, we employed analyst target prices which were outstanding 20 business days prior to the takeover announcement. We interpreted analyst opinions in our sample as of this date as expected future share prices of the stand-alone entity in the absence of takeover bids. More recent target prices may impound information regarding the upcoming takeover bid given the price runup prior a bid announcement (Schwert, 1996). A second reason why we exclude very recent target prices, is that as we investigate a potential reference point effect, we preferably evaluate a variable of which all informational value is discounted in stock prices by the time of the bid.[12] To correct for possible scale effects, we divided the average target price 20 business days prior to the announcement ($\overline{TP_{i,t-20}}$) by the share price at that time.[13] This gave us the target price implied expected return (*TPER*), see Eq. (4). After calculating the *TPER* for all firms, we winsorized this variable at the 1st and the 99th percentile (e.g., Brav et al., 2005).

$$TPER_{i,t} = \frac{\overline{TP_{i,t-20}}}{P_{i,t-20}} - 1. \quad (4)$$

Based on *RBP* we also created a dummy variable *RBP_DUM* which takes on the value of '1' when *BP* exceeds *TPER* and '0' otherwise.

Divergence of opinion in target prices (*DIVOP_TP*): To measure investors' opinion divergence regarding expected stock prices, we computed the standard deviation of target prices.[14] For opinion divergence in target prices, we computed the coefficient of variation, which equaled the standard deviation of all target prices of a target company 20 business days prior to the announcement normalized with the average target price of the company (*DIVOP_TP*), see Eq. (5). Analogous to *TPER*, we winsorized *DIVOP_TP* across the sample at the 1st and the 99th percentile.[15]

$$DIVOP\_TP_{i,t} = \frac{SD\left(\overline{TP_{i,t-20}}\right)}{\overline{TP_{i,t-20}}}. \quad (5)$$

Control variables

Research suggests several, other, determinants of merger completion rates which we will use as control variables.

(a) Target-related control variable: Prior studies have indicated that larger target companies are less likely to be successfully acquired than small target companies (Hoffmeister and Dyl, 1981;

[10] Samuelson and Rosenthal (1986) argued that the fallback price could be higher than the pre-bid stock price, resulting from permanent revaluation effects after withdrawn takeover bids (e.g., Dodd and Ruback, 1977 and Bradley, 1980). In our robustness checks, we computed an alternative fallback price reflecting this view.

[11] Schwert (1996) makes a distinction between the runup and the markup in takeover offers. The runup refers to price increases in the target shares prior to the official announcement of a bid. The markup is the post-announcement increase in the target's stock price. In our sample, the runup was negatively correlated to the markup ($p < 0.001$). In other words, the runup substitutes partly for the markup and for this reason, we considered the runup as part of the acquisition premium.

[12] We consider target prices published up to one day prior to the takeover announcement in our robustness checks.

[13] We employ the average *TPER* published by analysts, because Da and Schaumburg (2011, 164) reported that "several studies […] have found no systematic difference in analyst target price forecasting abilities". Hence, we did not make a distinction between certain types of analysts.

[14] Past studies have employed various measures for opinion divergence which are based on analyst opinions. For example, Diether et al. (2002) used the standard deviation of analyst earnings forecasts, and Moeller et al. (2007) employed the standard deviation of analysts' long-term growth forecasts. Both the earnings and the long-term growth forecasts are separate factors in a more complex framework leading to the investment opinion, and they therefore cover only a part of the opinion divergence.

[15] We considered an alternative measure for opinion divergence by estimating the percentage of outstanding target prices that were in excess of the takeover bid (unreported). All results remained highly significant when using this proxy for opinion divergence.

Raad and Ryan, 1995). In our analysis, we included *LNSIZE* which is defined as the natural logarithm of the target market value four weeks prior to the deal announcement.

(b) Acquirer-related control variables: Our sample includes both public and non-public bidders. Bargeron et al. (2008) showed that public bidders pay relatively higher takeover premiums. We included a dummy variable *PUBLICACQ* which takes on the value '1' if a bidder is publicly listed and '0' otherwise.[16]

(c) Deal-related control variables: Walkling (1985) and Holl and Kyriazis (1996), reported a positive association between merger completion and bid premiums. We therefore included the bid premium (*BP* as defined in Eq. (3)) that was offered to target shareholders in our regression analyses.

Wong and O'Sullivan (2001) suggested that equity financing introduces a greater level of ambiguity than cash financing. When paid with acquirer's stock, target shareholders participate in the risk of the merger. This increases the probability that the target company will reject an offer. We computed the variable *CASH*, which is the percentage of the consideration that is paid in cash, measured on a scale from 0 to 1.

Competition from other potential acquirers decreases the chance of takeover completion (Walkling, 1985). We included a dummy *MBIDDERS* that took the value '1' in case more than one company attempted to acquire the target and '0' if there was just one bidder.

Bates et al. (2006) showed that tender offers can increase the chances of completion. We therefore computed a dummy variable *TENDER* that took the value '1' for tender offers and '0' otherwise.

An offer is referred to as a 'hostile offer' when the target management does not recommend the current offer to its shareholders. Holl and Kyriazis (1997) discussed various studies, all of which found a lower probability of takeover success for hostile bids. We incorporated a dummy *HOSTILE*, which was coded as '1' for offers that were recorded as 'hostile' by SDC and as '0' otherwise.

Businesses of acquirers and targets can be closely related, which may generate more friction between target and acquirer, for example because of higher cost cutting or redundancies. This can decrease the chances of completion (Aguilera and Dencker, 2011). Antitrust measures may also decrease the completion rate in intra-industry deals. Conversely, a higher degree of relatedness may decrease chances of discovering a misfit at a later stage of the pre-deal process, which ultimately increases the chances of completion. To control for these possible effects, we included a dummy variable *SAMESIC* that took the value '1' when both the acquirer and the target shared the same 4-digit SIC code and '0' otherwise.

In addition, we included year-dummies to control for seasonal fixed effects and we controlled for possible industry effects by correcting for intra-group correlation (cluster) within the 4-digit SIC code of the target company.

3.3. Descriptive statistics

Table 1 displays some summary statistics. Panel A describes the complete sample. The average completion rate of intended takeovers was 0.85, which means that the sample included 194 announced takeovers which were withdrawn while 1117 intended takeovers were ultimately completed. Our measure for implied completion likelihood exhibits a slightly lower average. The average and median values for *IMPLIED* equals 0.78 and 0.88, respectively. Analysts published on average 6.3 target prices per company with a maximum of 33 (unreported). Panel A shows that the average target price implied expected return *(TPER)* equaled 26%. This is in line with Brav and Lehavy (2003), who reported an average *TPER* of 28%. The average bid premium was equal to 32%. *RBP_DUM* equals 0.67, indicating that *BP* exceeded *TPER* in 67% of all announced takeovers. The average target size equaled $1933 million. On average, 62% of the deal consideration was paid in cash. Considering our control variables in dummy-format: 2% of all deals were considered as 'hostile'; 17% constituted so-called tender offers; in 6% of all takeovers competing bidders were involved; 69% of all announced takeovers involved a publicly listed bidder; and in 35% of all takeovers the acquirer and target were active in the same industry. Panel B reports the annual distribution of selected variables. The period from 2000 to 2002 is the only interval where analysts' *TPERs* exceeded the bid premiums (*BPs*). This finding largely corresponds with studies of Agrawal and Chen (2008) and Cowen et al. (2006), who identified analyst optimism during the dot-com bubble. In the main sample, *RBP* equaled 0.05 on average, meaning that for the full sample the bid premium was on average 5% higher than the *TPER*.

Fig. 3 graphically connects the main concepts merger completion, *RBP* and *DIVOP_TP*. After sorting (from smallest to largest) on *RBP*, Panel A shows the relation between two main variables, i.e., deal completion and relative bid premium. Panel A shows a scatter plot with each dot representing the combination of *RBP* and outcome for a particular offer (0 if withdrawn, 1 if completed). The binary nature of the completion variable makes the scatter plot difficult to interpret. To improve the visualization of the data, we applied a 101 deals-based displaced moving average to offer completion. In other words, for each deal, we computed the average deal completion based on its own observation, the completion of the last 50 bids with a lower *RBP* and the completion of the first 50 bids with a higher *RBP*.[17] The result is a smoothed relation between deal completion and relative bid premiums. One could interpret this line as a 101 deals-based moving average which is displaced to the left by 50 observations. An *RBP* of 0 indicates that the bid price equals the average of analyst target prices (i.e., the assumed reference point). The smoothed completion ratio is 0.846 when *RBP* equals 0. According to our theoretical predictions, the completion likelihood should increase when offers start exceeding the target price, with decreasing marginal effects in *RBP*. The smoothed line indeed initially increases, and then flattens towards the right side of the graph. The last value of the smoothed completion rate equals 0.920. For negative *RBPs*, the completion rate decreases to a value of 0.733. Interestingly, the average completion rate does not decrease further once the takeover premium is sufficiently lower than the target price.

Panel B of Fig. 3 displays the completion rate vis-à-vis the opinion divergence witnessed in target prices. We posited that a higher degree of divergence was associated with a lower completion rate, since a greater proportion of shareholders would be dissatisfied with a given bid when divergence is high. The figure mildly confirms this expectation. We smoothed the completion rate similar to our procedure in Panel A. A low opinion divergence is associated with a completion rate of 0.881. In contrast, high levels of opinion divergence are associated with a completion rate of 0.780. Hence, preliminary evidence indicates a relationship between merger completion on the one hand, and *RBP* and *DIVOP_TP* on the other hand.

Table 2 reports the pair-wise correlations of the variables in our model. *COMPLETED* is positively correlated with *IMPLIED* ($\rho =$ 0.24) which indicates that the market's initial consideration of

[16] Potential additional control variables are 'acquirer size' and 'relative size of the target to the acquirer'. Including these variables would restrict our sample to publicly listed companies only. As an unreported robustness check, we included these variables in our regressions. This inclusion did not qualitatively change our results.

[17] This procedure excludes the computation of a value for the 50 deals with the lowest *RBP* and for the 50 deals with the highest *RBP*.

Table 1
Summary statistics. Panel A shows the distribution of selected variables. *COMPLETED* is a dummy that indicates whether the announced transaction has been completed (1) or not (0). *IMPLIED* stands for the implied completion rate, depending on the bid price, pre-bid stock price and post-bid stock price. *TPER* is the target price implied expected return, defined as the average target price 20 business days prior to the merger announcement divided by the share price at that time. *BP* is the bid premium, computed as the bid price divided by the stock price 20 business days prior to the announcement. *RBP* stands for the relative bid premium, which is equal to *BP* in excess of *TPER*. *RBP_DUM* is a dummy variable which is equal to 1 when *RBP* is greater than 0 and 0 otherwise. *DIVOP_TP* measures the divergence of opinion, and is calculated by dividing the standard deviation of the average target price by the average target price. *SIZE* refers to the market value of the target company while *LNSIZE* is the natural logarithm of *SIZE*. *CASH* is the percentage of the deal financed in cash (from 0 to 1). *HOSTILE* is a dummy for transactions that are recorded as 'hostile' in the SDC database. *TENDER* is a dummy that indicates a tender offer. MBIDDERS is a dummy variable capturing whether there were multiple bidders for the target or not. *PUBLICACQ* is a dummy for a publicly listed acquirer. *SAMESIC* dummies whether the target and the acquirer share the same SIC code. Panel B shows the mean values on a year-by-year basis for selected variables.

Panel A. Selected summary statistics

Variable	Mean	Standard deviation	Median	Min	Max	# of obs
COMPLETED (dum)	0.85	0.36		0	1	1311
IMPLIED	0.78	0.22	0.88	0	1	924
TPER	0.26	0.30	0.18	−0.08	1.14	1311
BP	0.32	0.22	0.28	−0.03	0.82	1311
RBP	0.05	0.31	0.09	−1.17	0.90	1311
RBP_DUM (dum)	0.67	0.47		0	1	1311
DIVOP_TP	0.15	0.11	0.12	0	0.61	1311
SIZE	1933	4723	667	100	61 103	1311
LNSIZE	6.61	1.24	6.50	4.61	11.02	1311
CASH	0.62	0.43	0.88	0	1	1311
HOSTILE (dum)	0.02	0.15		0	1	1311
TENDER (dum)	0.17	0.37		0	1	1311
MBIDDERS (dum)	0.06	0.23		0	1	1311
PUBLICACQ (dum)	0.69	0.46		0	1	1311
SAMESIC (dum)	0.35	0.48		0	1	1311

Panel B. Mean values for selected variables per year

Year	COMPLETED	IMPLIED	RBP	DIVOP_TP	# of obs.
1999	0.91	0.64	0.01	0.15	56
2000	0.82	0.68	−0.14	0.22	114
2001	0.87	0.70	−0.23	0.22	70
2002	0.85	0.73	−0.08	0.17	40
2003	0.89	0.76	0.14	0.16	66
2004	0.91	0.75	0.08	0.13	76
2005	0.87	0.80	0.06	0.13	108
2006	0.84	0.81	0.05	0.12	148
2007	0.83	0.78	0.11	0.12	152
2008	0.66	0.74	0.02	0.17	74
2009	0.94	0.83	0.18	0.19	47
2010	0.89	0.86	0.09	0.13	79
2011	0.82	0.83	0.12	0.14	85
2012	0.89	0.89	0.12	0.14	70
2013	0.89	0.88	0.18	0.13	66
2014	0.85	0.81	0.16	0.11	60
Total	0.85	0.78	0.05	0.15	1311

takeover announcements is in line with the final merger outcome. Interestingly, both variables are positively related to RBP and BP, and negatively to *DIVOP_TP*. The sign of the correlation coefficient between both *COMPLETED* and *IMPLIED* on the one hand and control variables on the other, is not always in conjunction. The positive association between *BP* and analyst target price divergence (e.g., *DIVOP_TP*) is in line with findings by Chatterjee et al. (2012).

All econometric specifications were run with heteroskedasticity-consistent estimators of variance (a.k.a. 'robust' estimations). We tested all regressions for multi-collinearity by using the variance-inflation factor (VIF). The year-dummies exhibited VIF values of up to 3.91, while the variance-inflation factors of other variables never exceeded 1.77. These values are well below the cut-off level of 10 (Belsley et al., 1980; Studenmund, 1992). We could therefore conclude that multi-collinearity was not an issue of concern in this study.

4. Results

4.1. Completion rate

Following up on the visual inspection, we discuss econometric tests in this section. We first related takeover completion (*COMPLETED*) to the relative bid premium (*RBP*). As previous research (e.g., Walkling, 1985; Holl and Kyriazis, 1996) indicated that the completion likelihood is related to bid premiums – which partly define our main variable of interest RBP –, we controlled in all specifications for the bid premium (*BP*) offered. We estimated all models using a linear probit regression s the dependent variable was a dummy variable,.

Table 3 reports the results of the estimations. We estimated five different models. The baseline model, Model 1, only incorporated control variables. The statistically significant variables all show the expected signs: the bid premium (*BP*) is positively related to merger completion. A 10% higher bid premium is associated with a 1% higher completion likelihood. In addition, *TENDER* and *PUBLICACQ* have positive and significant coefficients while *MBIDDERS* and *HOSTILE* both affected the completion rate negatively. These

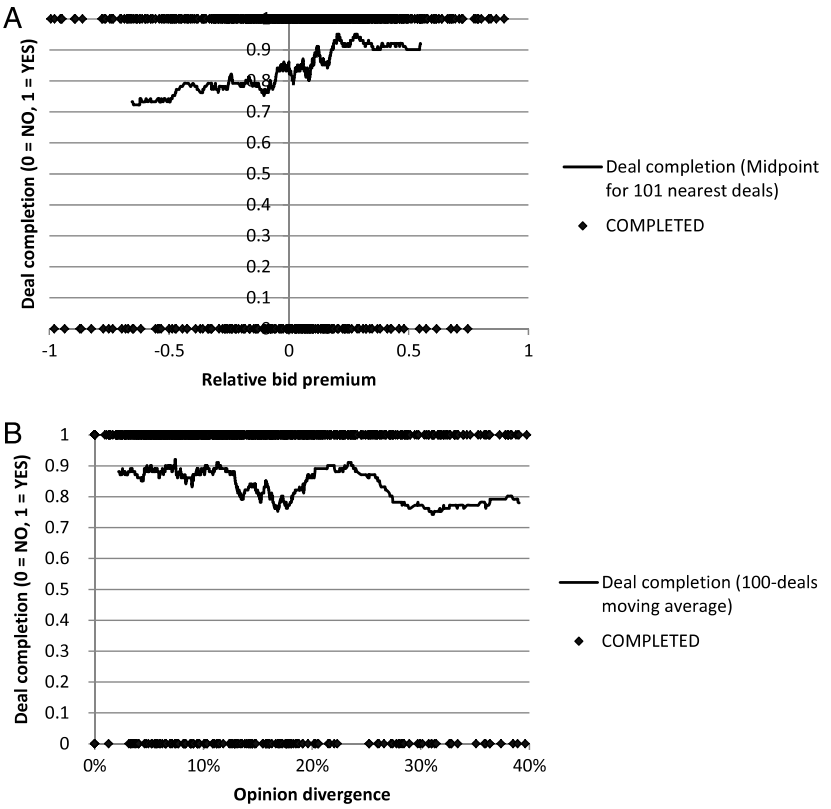

Fig. 3. Completion, relative bid premium, and opinion divergence. Panel A relates the relative bid premium to the ultimate completion rate. Deals are first sorted based on *RBP*, after which we created a scatter plot. We have added a smoothed line, which is per deal computed as the average of its own completion rate, the completion rate of the last 50 deals with an *RBP* lower than its own *RBP*, and the first 50 deals with an *RBP* higher than its own *RBP*. We apply this smoothing on a moving basis. We have cropped this graph at the left hand side to improve its viewability. Panel B relates the opinion divergence (*DIVOP_TP*) to the ultimate completion rate. Deals are first sorted based on *DIVOP_TP*, after which we created a scatter plot. We have added a smoothed line, which is per deal computed as the average of its own completion rate, the completion rate of the last 50 deals with a *DIVOP_TP* lower than its own *DIVOP_TP*, and the first 50 deals with a *DIVOP_TP* higher than its own *DIVOP_TP*. We apply this smoothing on a moving basis. We have cropped this graph at the right hand side to improve its viewability.

Table 2
Pairwise correlation table of selected variables. See Table 1 for variable definitions. *P*-values in parentheses.

	COMPLETED	IMPLIED	RBP	DIVOP_TP	BP	LNSIZE	CASH	HOSTILE	TENDER	MBIDDERS	SAMESIC
IMPLIED	0.24	1.00									
	(0.00)										
RBP	0.15	0.17	1.00								
	(0.00)	(0.00)									
DIVOP_TP	−0.08	−0.07	−0.28	1.00							
	(0.00)	(0.05)	(0.00)								
BP	0.10	0.19	0.40	0.15	1.00						
	(0.00)	(0.00)	(0.00)	(0.00)							
LNSIZE	−0.02	−0.16	0.15	−0.11	−0.15	1.00					
	(0.56)	(0.00)	(0.00)	(0.00)	(0.00)						
CASH	−0.10	0.48	0.16	−0.09	0.11	−0.14	1.00				
	(0.00)	(0.00)	(0.00)	(0.11)	(0.00)	(0.00)					
HOSTILE	−0.26	−0.18	−0.06	0.03	−0.04	0.06	0.04	1.00			
	(0.00)	(0.00)	(0.04)	(0.33)	(0.14)	(0.02)	(0.14)				
TENDER	0.05	0.28	0.06	0.06	0.21	−0.11	0.32	0.13	1.00		
	(0.05)	(0.00)	(0.02)	(0.04)	(0.00)	(0.00)	(0.00)	(0.00)			
MBIDDERS	−0.38		−0.02	0.02	−0.06	0.07	0.08	0.12	−0.01	1.00	
	(0.00)		(0.55)	(0.53)	(0.02)	(0.02)	(0.00)	(0.00)	(0.85)		
PUBLICACQ	0.16	−0.13	0.02	0.05	0.10	0.06	−0.43	0.01	−0.05	−0.09	1.00
	(0.09)	(0.00)	(0.58)	(0.10)	(0.00)	(0.04)	(0.00)	(0.69)	(0.08)	(0.00)	
SAMESIC	0.09	−0.10	0.04	−0.00	0.02	0.05	−0.17	0.03	−0.02	−0.04	0.24
	(0.00)	(0.00)	(0.16)	(0.94)	(0.47)	(0.06)	(0.00)	(0.25)	(0.57)	(0.12)	(0.00)

effects have been widely documented in the existing literature. The positive sign of *SAMESIC* indicates that the likelihood of completion increases with 0.048 (i.e., 4.8%) when the involved firms are active in the same industry.

The other models show the estimation results for our hypotheses. In Model 2, we found that the relative bid premium (*RBP*) was strongly positively related to the completion rate of mergers, which implies that a relatively higher takeover offer as compared to the average target price is associated with a higher probability of completion. The reported coefficients represent the marginal effects on the dependent variable. They show that the economic significance of this relationship is not trivial: a 10% increase in the relative bid premium is associated with a 1.4% increase in the probability of completing the merger. Interestingly, *BP* becomes

Table 3
Estimation results for the completion rate. The dummy variable *COMPLETED* is the dependent variable in this probit estimation. This dummy equals one if an intended takeover ultimately has been successful. See Table 1 for an explanation of the other variables. Coefficients represent the marginal effects on the dependent variable. The model is estimated using robust standard errors, with clustering at the 4-digit-SIC industry level. Year-dummies are included.

	Dependent variable: COMPLETED				
	Model 1	Model 2	Model 3	Model 4	Model 5
RBP		0.141***			
		(3.80)			
RBP_DUM			0.075***		
			(3.89)		
TPER				−0.141***	
				(−3.80)	
DIVOP_TP					−0.237**
					(−3.06)
BP	0.104*	0.004	0.054	0.004	0.113**
	(2.40)	(0.10)	(1.26)	(0.10)	(2.75)
LNSIZE	0.007	−0.002	0.003	−0.002	0.005
	(0.94)	(−0.18)	(0.32)	(−0.18)	(0.59)
CASH	−0.040	−0.047	−0.044	−0.047	−0.046
	(−1.31)	(−1.51)	(−1.44)	(−1.51)	(−1.41)
HOSTILE	−0.657***	−0.644***	−0.651***	−0.644***	−0.648***
	(−6.96)	(−6.52)	(−6.57)	(−6.52)	(−6.70)
TENDER	0.087**	0.083**	0.086***	0.083**	0.086***
	(3.37)	(3.29)	(3.39)	(3.29)	(3.48)
MBIDDERS	−0.565***	−0.562***	−0.557***	−0.562***	−0.557***
	(−12.24)	(−11.95)	(−12.05)	(−11.95)	(−12.11)
PUBLICACQ	0.073*	0.070**	0.068**	0.070**	0.071**
	(3.25)	(3.11)	(3.04)	(3.11)	(3.11)
SAMESIC	0.048*	0.044*	0.044*	0.044*	0.045*
	(2.28)	(2.05)	(2.12)	(2.05)	(2.15)
YEAR-DUMMIES	INCL.	INCL.	INCL.	INCL.	INCL.
n	1311	1311	1311	1311	1311
Pseudo R^2	0.23	0.25	0.25	0.25	0.24

z-statistics in parentheses.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

insignificant once we include *RBP* in our estimations. This is an indication that the bid premium itself is less relevant for takeover completion than the bid premium relative to the *TPER*.

In Model 3, we replaced *RBP* by *RBP_DUM*. Using this specification, we test for a discontinuity around the average target price (e.g., the reference point). The results indicate that an offer in which *BP* exceeds *TPER* has a 7.5% higher likelihood of completion relative to an offer below the target price. This positive association is in line with the findings in Model 2.

In Models 2 and 3, *BP* was not only explicitly present as a control variable, but also implicitly in *RBP* and *RBP_DUM*. To illustrate the effect of the target price (i.e., *TPER*) itself, we regressed the completion rate on *TPER* separately in Model 4 while still controlling for *BP*. The economic and statistical significance of *TPER* is equivalent to that of *RBP* in Model 2. Model 5 reports the effects of opinion dispersion. This model shows that *DIVOP_TP* is statistically significantly associated with the completion rate of mergers. A 10% increase in *DIVOP_TP* is related to a 2.4% decrease in completion likelihood. We conclude that opinion dispersion present in target prices can function as an indication for takeover completion probabilities. The higher the divergence in target prices, the lower the completion rate. The control variables which exhibited statistical significance remain significant in all models, except for the bid premium. *BP* is significant in Model 1 and Model 5 only.

To summarize Table 3, we found support for Hypothesis 1 and 2. We conclude that both the target price and its dispersion can function as indicators for takeover completion probability. The higher the target price relative to the takeover bid, the smaller the likelihood of takeover completion. In addition, target price dispersion is also negatively related to the completion rate.

4.2. Implied completion likelihood

Whereas merger completion is the ultimate outcome of a takeover bid, shareholders' initial anticipation regarding the probability of a successful outcome can be witnessed by studying the post-bid share price, the pre-bid share price and the estimation of a fallback price. As the implied completion probability is a variable in the range [0, 1], we use fractional response models with a probit model for the conditional mean for our tests (Papke and Wooldridge, 1996).[18] Table 4 reports marginal effects for an easier interpretation of the economic significance of the estimated coefficients. The baseline model, Model 1, includes control variables only. We used the same set of control variables as in our previous tests. Again, the coefficient of the bid premium is positive and statistically significant. A 10% higher bid premium is associated with a more than 2% higher implied completion likelihood. In addition, *CASH*, *TENDER*, and *PUBLICACQ* are positively related to the implied completion rate, while *LNSIZE* and *HOSTILE* are negatively related to the implied completion likelihood. The sign for the dummy *SAMESIC* is negative as well, but statistically insignificant.

Model 2 incorporates the relative bid premium. *RBP* is positive and significant with a coefficient of 0.075. This indicates that the implied completion rate increases in the *RBP*: a 10% higher *RBP* is associated with a 0.75% higher implied completion rate. The sign of control variables is unaltered in this estimation. The significance levels of the variables are generally similar across the Models 1 and 2, with the exception of LNSIZE which becomes significant at the 1% level in Model 2. Model 3 considers the dummy variable *RBP_DUM*.

[18] We tested our models using OLS-specification as well. The reported results did not meaningfully change.

Table 4
Estimation results for the implied completion likelihood. The dependent variable *IMPLIED* reflects the implied completion likelihood measured 1 day after the bid has been made public. See Table 1 for an explanation of independent variables. The model is estimated using fractional regression techniques; coefficients represent the marginal effects on the dependent variable. Robust standard errors are used. Year-dummies are included.

	Dependent variable: IMPLIED			
	Model 1	Model 2	Model 3	Model 4
RBP		0.075**		
		(3.01)		
RBP_DUM			0.044**	
			(2.98)	
DIVOP_TP				−0.206**
				(−3.29)
BP	0.231***	0.192***	0.216***	0.252***
	(6.24)	(5.09)	(5.90)	(6.56)
LNSIZE	−0.10*	−0.013**	−0.012*	−0.010*
	(−2.02)	(−2.68)	(−2.50)	(−2.21)
CASH	0.211***	0.210***	0.211***	0.213***
	(11.44)	(11.40)	(11.40)	(11.58)
HOSTILE	−0.287***	−0.288***	−0.286***	−0.287***
	(−5.30)	(−5.30)	(−5.23)	(−5.56)
TENDER	0.127***	0.127***	0.127***	0.128***
	(6.31)	(6.50)	(6.44)	(6.54)
PUBLICACQ	0.030*	0.030*	0.029*	0.032*
	(2.06)	(2.06)	(2.00)	(2.17)
SAMESIC	−0.034	−0.016	−0.017	−0.014
	(−1.04)	(−1.20)	(−1.29)	(−1.11)
YEAR-DUMMIES	INCL.	INCL.	INCL.	INCL.
n	924	924	924	924
Pseudo R^2	0.11	0.11	0.11	0.11

z-statistics in parentheses.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

This dummy takes on a value of '1' when the takeover premium exceeds the target price, and '0' otherwise. The outcome shows that if the dummy is 1 (i.e., *BP* exceeds *TPER*), the proposed merger has a 4.4% higher chance of completion. In Model 4, we related the implied completion rate to the dispersion of opinions measured through target prices. We found that a higher dispersion of opinions leads to a decrease in the implied completion likelihood. This finding is in line with our expectations: a higher dispersion is associated with less willingness among target shareholders to tender their shares, which in turn decreases the (implied) completion likelihood. A 10% increase in *DIVOP_TP* is associated with a 2.06% decrease in implied completion likelihood.

4.3. Robustness of the reported results

We found that takeover completion was significantly related to bid premiums relative to target price implied expected returns, and to opinion divergence present in target prices. The presented results are robust to different model modifications, see below. Table 5 shows the outcome of these alterations. While we have tested all models including control variables and year-dummies, we do not report their coefficients for brevity.

(i) In all our tests, we employed the average target price published by analysts four weeks prior to the announcement of the bid, as the takeover literature (e.g., Schwert, 1996) identified a stock price runup predominantly occurring during the last four trading weeks prior to a takeover bid. We applied this approach as we were interested in analyst target prices for the stand-alone firm, e.g., target prices in the absence of potential takeover rumors. However, one can argue that shareholders use analyst target prices outstanding at the time of the takeover bid as a reference point. For robustness, we re-estimate our main results based on the average target price outstanding on the day prior to a bid. We estimated models for both *COMPLETED* and *IMPLIED* as dependent variables. Please see Panel A of Table 5 for the estimation results. Note that the number of observations decreases slightly as we introduced an additional requirement of a minimum of 2 target price observations one day prior to the bid. The results show that both the target price and its dispersion one day prior to the bid are highly related to the takeover outcome. In the *COMPLETED* estimations, the economic relationship is somewhat weaker than reported in our main tests for *RBP*, while the relation is somewhat stronger for opinion divergence. In both our *IMPLIED* estimations, effect sizes are somewhat smaller but they remain statistically significant.

(ii) We followed Samuelson and Rosenthal (1986) by allowing the post-bid fallback price to reflect new information about the potential value of the target firm to arrive at $P_{F,i}$.[19] Here, we used the observed fallback prices of non-completed deals in our restricted *IMPLIED*-sample for an estimation of the fallback prices for ultimately completed deals. The underlying assumption is that the fallback behavior of withdrawn deals is indicative for the fallback behavior of ultimately completed deals. Following Samuelson and Rosenthal (1986), we can write the fallback price as:

$$P_{F,i} = \beta_0 + \beta_1 P_{i,t-20} - \beta_2 P_{B,i,t}. \quad (6)$$

For $P_{F,i}$ we use the observed stock price 1 week (i.e., 5 business days) after the offer has been withdrawn. This period of 1 week is long enough for the stock price to absorb all information regarding the failed deal, and short enough as to minimize additional confounding effects. As $P_{F,i}$ should lie in between the bid price and the price prior to the bid (given that we have excluded offers with competing bids), we posit that β_0 should equal 0 and $\beta_1 + \beta_2$ should equal 1. We estimated this regression for 85 non-completed deals in the restricted IMPLIED-sample. This resulted in the following constrained regression equation:

$$P_{F,i} = \underset{(10.48)}{0.81 P_{i,t-20}} + \underset{(2.45)}{0.19 P_{B,i,t}}$$

In brackets, the *t*-values are reported. The coefficients of 0.81 and 0.19 indicate that the target firms' share prices after a failed bid do not fully revert back to their original pre-bid price, and that the market does not discount the offer completely. When we compute a new value for $P_{F,i}$ for each deal[20] and we substitute the original values in Eq. (1) (see Section 3.2) for these new values, we found an average implied completion rate of 0.76 with a median value of 0.85. In total, we analyzed 897 deals with this method. Table 5, Panel B, shows the regression results when using our revised version of *IMPLIED* as dependent variable. In all models, our main independent variables remain strongly statistically significant. For brevity, we have not displayed the coefficients of our control variables.

(iii) Our results for *RBP* are robust to data selection specifications. Initially, we excluded target firms for which only one target price was available as these deals did not allow the

[19] Note that the sizes of the restricted samples are unequal due to the different definition of $P_{F,i}$ across both samples.

[20] We apply the same criteria to this *IMPLIED*-sample by restricting the sample to takeover bids without competing bids only. Additionally, we excluded (i) bids resulting in negative arbitrage spreads and (ii) bids where either $P_{i,t+1} < P_{F,i}$ and/or $P_{B,i,t} < P_{F,i}$ as to ensure that the breakeven probability remains within the [0,1] interval.

computation of a measure for opinion dispersion. In our third robustness check, we included these deals and set the *DIVOP_TP* to zero for these cases. Our main sample increased to 1567 observed takeover bids as a result, while our restricted *IMPLIED*-sample increased to 1110 observations. Panel C of Table 5 shows the results with respect to *RBP* and *DIVOP_TP* in relation to both ultimate deal completion and the implied completion likelihood. Both variables remained highly significant with effect sizes relatively similar to earlier results.

(iv) Table 1 illustrated an 8% point difference between the average and the median *TPER*. In unreported tests, we regressed both the completion rate and the implied completion rate on *RBP* based on the median *TPER* instead of the average *TPER*. The coefficients for *MEDIAN_RBP* were equivalent to that of the *RBP*. All reported significant results remained intact.

(v) Furthermore, we verified that the coding of control variables did not determine our conclusions. We therefore adjusted *MBIDDERS* to the absolute number of bidders, and changed the continuous variable *CASH* into a dummy variable which was coded '1' as the deal was fully financed with cash, and '0' otherwise. None of these changes qualitatively changed our results, and they are, therefore, not reported in Table 5.

5. Conclusion and discussion

In this paper, we examined whether the level of the takeover bid relative to the level of published analyst target prices is an indication for the completion rate of takeover offers. We built our argument on the insights from prospect theory. Given the wide dissemination of analyst target prices among the investing community, we predicted that target prices would function as a reference point for investors when deciding to sell their shares to the acquiring firm. In addition, we considered the dispersion in target prices. A high dispersion implies the existence of relatively high target prices which can, in turn, cause a subset of investors to have relatively high reference points. We predicted that merger completion would be lower for higher target price dispersion. While our approach is price-oriented, we acknowledge that the merger outcome is a dynamic process in which many other factors play a role. We therefore controlled for common deal-specific determinants that indirectly include dynamic aspects (e.g., the number of bidders) in our regression analyses.

We considered both the ultimate completion rate of offers, and the initial completion likelihood estimated 1 day after an offer was announced. Our results indicated that the target price indeed functions as a reference point among investors. Not only did we find indications that the target price served as a reference point for both initially established completion likelihood and ultimately realized deal completion, we also found that the divergence of opinion present in target prices mattered for both indicators. In a discussion of our findings, we focus on (i) an alternative explanation of our findings, and (ii) a comparison of target prices as reference point to recent peak prices as reference point for takeover completion as introduced by Baker et al. (2012).

(i) *An alternative explanation: information effect of target prices*

In our main tests, we established a relation between relative bid premiums and (anticipated) merger completion. We attributed these findings to the existence of a reference point effect. A second, alternative, reason why target prices might matter for takeover completion is a potential information effect. Target price revisions are generally quickly reflected in stock prices (e.g., Asquith et al., 2005; Kerl and Walter, 2008; Huang et al., 2009) while target prices are often inaccurate and too high in the long run (Brav and Lehavy, 2003; Asquith et al., 2005). If, however, target prices would have investment value beyond the initial price response, one could argue that the information content in target prices is not fully discounted at the time of the target price revision. In other words, outstanding target prices at the time of a takeover offer announcement might still contain non-discounted relevant information about firm values. This logic would imply that the association between target prices and merger completion may be driven by an information effect, beyond that of a reference point. We already mitigated such a potential impact by using target prices issued four weeks prior to the bid. In an attempt to disentangle the information effect and the reference point effect, we evaluated the relevance of analyst recommendations in the takeover process. Recommendations are generally published simultaneously with target prices, and represent an analyst's opinion on the preferred action to take in a given company's shares: should investors buy, hold, or sell the shares? Generally, analysts have a five-point scale at their disposal to rank stocks. This scale ranges from strong buy to strong sell. Just like target prices, recommendations have an impact on stock returns (e.g., Stickel, 1995; Womack, 1996).[21] As such, both target prices and recommendations convey similar information to investors.[22] Not surprisingly, Bradshaw (2002) found that recommendation levels and target price implied expected returns are positively correlated.

Given the similarity in information content between target prices and recommendations, we related merger completion and initial bid reception to the average recommendation level and its dispersion. While recommendations are related to target prices, recommendations are less useful as a reference point, given that recommendations are generally issued on a five-point scale and are not price-denominated as is the case with target prices. Hence, if the takeover outcome would be related to the average recommendation level of the target stock (just as it is related to target prices), we could conclude that the relation between analyst opinions and takeover completion is driven by something else than a reference point effect. It could then be possible that non-discounted information present in recommendations and target prices drives the relation with takeover outcomes. If, on the other hand, recommendations are unrelated to takeover completion, we consider this as a further indication that the relation between target prices and takeover completion is a manifestation of the reference point effect.

For the same sample we used in all our tests so far, we collected analyst recommendations. $I/B/E/S$ publishes recommendations on a 1–5 scale. This scale is inverse, meaning that the lowest number corresponds to the highest recommendation, which means 1 is a strong buy and 5 a strong sell. To allow for an easier interpretation, following Jegadeesh et al. (2004), we reversed the scale so that the most favorable recommendation corresponds to the highest score. Subsequently, we computed the mean of all outstanding recommendations for each target firm 20 business days prior to the takeover bid where we required a minimum of 2 outstanding recommendations to be able to compute opinion dispersion. This variable is denoted *REC* in our estimations. The mean recommendation was 3.75, corresponding to a level close to a 'buy' recommendation. We confirm for our sample the positive correlation between recommendations and *TPER*. The Pearson correlation coefficient between both variables is 0.36 and highly

[21] While the evidence for the short-term effects of recommendations is widely documented, the mapping of recommendation levels to stock prices in the long run is debated. For example, for investment horizons beyond the short run, Jegadeesh et al. (2004) showed that portfolios based on recommendation levels were not associated with abnormal returns.

[22] A difference between target prices and recommendations is that the former captures the expected return, while the latter depends on the difference between the expected and the required rate of return (Huang et al., 2009).

Table 5
Estimation results for robustness checks.

Panel A. The dummy variable *COMPLETED* is the dependent variable in the probit estimations of Models 1 and 2. *IMPLIED* is the dependent variable in fractional response models 3 and 4. *RBP_1DAY* is the relative bid premium based on both the share price and the average target price 1 day prior to the bid announcement. *DIVOP_TP_1DAY* is defined as the standard deviation of the target price 1 day prior to the bid announcement divided by the average target price at that time. See Table 1 for an explanation of the control variables. Coefficients represent the marginal effects on the dependent variable. Models 1 and 2 are estimated using robust standard errors, with clustering at the 4-digit-SIC industry level. Fractional response models 3 and 4 use robust standard errors by default.

Dependent:	COMPLETED		IMPLIED	
	Model 1	Model 2	Model 3	Model 4
RBP_1DAY	0.080***		0.054***	
	(4.85)		(3.72)	
DIVOP_TP_1DAY		−0.327***		−0.153*
		(−4.44)		(−2.32)
CONTROLS	INCL.	INCL.	INCL.	INCL.
YEAR-DUMMIES	INCL.	INCL.	INCL.	INCL.
n	1272	1272	896	896
Pseudo R^2	0.26	0.25	0.10	0.10

Panel B. The dependent variable is an alternative specification of *IMPLIED*, see Section 4.3 for the variable definition. See Table 1 for an explanation of independent variables. Coefficients represent the marginal effects on the dependent variable. All fractional regression models use robust standard errors by default.

Dependent:	IMPLIED (alternative specification)				
	Model 1	Model 2	Model 3	Model 4	Model 5
RBP	0.091**				
	(3.06)				
RBP_DUM		0.037*			
		(2.21)			
DIVOP_TP			−0.250**		
			(−3.27)		
RBP_1DAY				0.062**	
				(3.48)	
DIVOP_TP_1DAY					−0.207**
					(−2.66)
CONTROLS	INCL.	INCL.	INCL.	INCL.	INCL.
YEAR-DUMMIES	INCL.	INCL.	INCL.	INCL.	INCL.
n	897	897	897	869	869
Pseudo R^2	0.11	0.11	0.11	0.10	0.10

Panel C. The dummy variable *COMPLETED* is the dependent variable in the probit estimations of Models 1 and 2. *IMPLIED* is the dependent variable in fractional response models 3 and 4. See Table 1 for an explanation of the control variables. Coefficients represent the marginal effects on the dependent variable. All models are estimated using robust standard errors; in Models 1 and 2 clustering at the 4-digit-SIC industry level is applied.

Dependent:	COMPLETED		IMPLIED	
	Model 1	Model 2	Model 3	Model 4
RBP	0.143***		0.110***	
	(4.41)		(5.00)	
DIVOP_TP		−0.202**		−0.140*
		(−3.09)		(−2.48)
CONTROLS	INCL.	INCL.	INCL.	INCL.
YEAR-DUMMIES	INCL.	INCL.	INCL.	INCL.
n	1567	1567	1110	1110
Pseudo R^2	0.25	0.24	0.11	0.10

z-statistics in parentheses.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

significant ($p < 0.001$). The coefficient is similar to Bradshaw (2002), who reported a correlation of 0.33. In addition, we also computed the standard deviation of the recommendation level (*DIVOP_REC*) of a target company four weeks prior to the announcement. The average level of *DIVOP_REC* in our sample is 0.76.

Panel A of Table 6 depicts four different estimations. We included control variables and year-dummies, but did not display them given that their economic and statistical significance is similar to previous estimations. In Model 1, we regressed *COMPLETED* on the average recommendation level and control variables. The coefficient of the recommendation variable equaled 0.016 and was statistically insignificant. Model 2 considered the relation between *COMPLETED* and *DIVOP_REC*. Again, the relation was insignificant. Models 3 and 4 studied the relation between *IMPLIED* and the

Table 6
Estimation results for discussion section.

Panel A. This table provides the outcomes based on analyst recommendations. The dummy variable *COMPLETED* is the dependent variable in the probit estimations of Models 1 and 2. *IMPLIED* is the dependent variable in fractional response models 3 and 4. *REC* is the average issued recommendation level outstanding 20 business days prior to a bid. This variable was recoded so that 1 (5) is the lowest (highest) possible recommendation. *DIVOP_REC* is the standard deviation of the average recommendation level 20 business days prior to a bid. See Table 1 for an explanation of control variables. Coefficients represent the marginal effects on the dependent variable. All models are estimated using robust standard errors, in Models 1 and 2 clustering at the 4-digit-SIC industry level is applied.

Dependent:	COMPLETED		IMPLIED	
	Model 1	Model 2	Model 3	Model 4
REC	0.016		0.009	
	(1.02)		(0.86)	
DIVOP_REC		−0.023		−0.016
		(−0.68)		(−0.84)
CONTROLS	INCL.	INCL.	INCL.	INCL.
YEAR-DUMMIES	INCL.	INCL.	INCL.	INCL.
n	1301	1301	918	918
Pseudo R^2	0.23	0.23	0.11	0.11

Panel B. This panel provides a comparison between the relevance of target prices and peak stock prices as reference points. The dummy variable *COMPLETED* is the dependent variable in the probit estimations of Models 1 and 2. *IMPLIED* is the dependent variable in fractional response models 3 and 4. *RBP_PEAK* is the difference between the bid premium and the 52-week high price as a percentage of the stock price 20 business days prior to the announcement of a takeover bid. *RBP_PEAK_DUM* was coded '1' if the bid exceeded the 52-week high share price and '0' if not. See Table 1 for an explanation of other variables. Coefficients represent the marginal effects on the dependent variable. All models are estimated using robust standard errors, in Models 1 and 2 clustering at the 4-digit-SIC industry level is applied.

Dependent:	COMPLETED		IMPLIED	
	Model 1	Model 2	Model 3	Model 4
RBP	0.109**		0.088**	
	(3.08)		(3.29)	
RBP_PEAK	0.024*		0.017	
	(2.11)		(1.48)	
RBP_DUM		0.037*		0.151**
		(2.01)		(2.76)
RBP_PEAK_DUM		0.082***		0.127*
		(3.68)		(2.48)
CONTROLS	INCL.	INCL.	INCL.	INCL.
YEAR-DUMMIES	INCL.	INCL.	INCL.	INCL.
n	1567	1567	1110	1110
Pseudo R^2	0.24	0.23	0.11	0.11

z-statistics in parentheses.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

recommendation level and its dispersion, respectively. In line with our findings on ultimate deal completion, the coefficients were not statistically significant.

We conclude that, despite similarities between target prices and recommendations, the latter is unrelated to takeover completion. We therefore dismiss the informational effect as an explanation for the relation between target prices and completion rates.

(ii) *Comparing target prices as reference point to recent stock price highs*

Our main finding that the target price functions as an important reference price in the evaluation of takeover offers complements the findings by Baker et al. (2012) regarding the impact of recent stock price highs. In their empirical explanation of merger completion, Baker et al. (2012) added a dummy variable which was coded '1' if the takeover bid exceeded the 52-week high price. When explaining deal completion using this dummy and various control variables, they found a coefficient varying from 0.044 to 0.064 for the dummy variable. In other words, a takeover bid higher than the recent stock price high lead to a 4.4% to 6.4% point increase in completion probability. The magnitude of our findings is of a similar magnitude as we found for *RBP_DUM* coefficients of 0.075 and 0.044 for *COMPLETED* and *IMPLIED*, respectively. Anecdotal evidence points towards the use of both reference prices among investors. For example, in an announcement about an investigation on behalf of target shareholders to the fairness of a $17-per-share bid by GeoEye on DigitalGlobe on May 4, 2012, it was stated that "shares of DigitalGlobe Inc (NYSE:DGI) traded as early as February 14, 2012 as high as $17.27 per share and in July 2011 as high as $26.78 per share. In addition, at least one analyst has set the high target price for NYSE:DGI shares at $36 per share. Thus recent as well as historic and estimated prices are all well above the current offer". (www.shareholdersfoundation.com, May 4, 2012). The question remains whether historic prices or analyst forecasts of future prices serve as a stronger indicator for merger completion. We conducted tests in which we explained *COMPLETED* and *IMPLIED* by both the average target price and the recent peak price, alongside control variables and year-dummies. For this test, we computed a new variable *RBP_PEAK* which was defined as the difference between the bid and the 52-week high price (as a percentage of the stock price, winsorized as in Baker et al., 2012). In addition, we computed a dummy (*RBP_PEAK_DUM)* which was coded '1' if the bid exceeded the 52-week high share price and '0' if not. As we do not discuss opinion divergence in this comparison, we do not require a minimum of two published target prices in these tests. Panel B of Table 6 displays our results. First, we turn to Model 1 where we explained deal completion simultaneously by *RBP* and *RBP_PEAK*. The coefficient of *RBP* equals 0.109 and is around four times as large as the coefficient for *RBP_PEAK*. In addition, *RBP* is significant at the 1% level, while *RBP_PEAK* is significant at the 5% level only. Model 2 relates *COMPLETED* to both dummy variables simultaneously. In this case, *RBP_PEAK_DUM* has a larger coefficient and is statistically more significant. Models 3 and 4 use *IMPLIED* as dependent variable. In both models, the relative bid premium based on target prices is both economically and statistically more meaningful than when this premium is based on recent peak prices. Apparently, historical stock price information as well as analyst forecasts function as reference points to investors. However, in three out of four models, target prices seem to play a more important role. Although a comprehensive study of the relative importance of potential reference points during a takeover process is beyond the scope of this paper, we believe that this issue represents an important and promising avenue for future research.

A limitation of our study is that we do not have reasons for non-completion at our disposal. We acknowledge that takeover attempts can fail for more reasons than an insufficient bid price. We tried to correct for other considerations by including several well-known control variables in our analyses. As such, our setup is similar to Baker et al. (2012). Future research could be aimed at uncovering reasons for failure and connecting a subset of takeover bids to reference points.

To conclude, we have identified analyst target prices as a reference point for merger completion. Our findings suggest that target prices can be considered as a benchmark which needs to be surpassed in order to complete intended takeover bids. Such a benchmark could also be relevant for practitioners in the field of mergers and acquisitions as it contributes to our understanding of why some takeover offers fail.

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