

# **Corporate serial acquisitions: An empirical test of the learning hypothesis**

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## **Abstract**

Aktas, de Bodt and Roll (forthcoming, Journal of Corporate Finance) develop a theoretical model of CEO learning in merger and acquisition deal making. This study offers a test of the learning hypothesis using a sample of 235 U.S. CEOs. Consistent with the theory, CEOs take investors' reactions to their previous deal announcements into account to adjust their bidding behaviors in subsequent transactions.

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## **1. Introduction**

Aktas, de Bodt, and Roll (forthcoming; hereafter, ADR) argue that declining abnormal returns for serial acquirers during a program sequence are compatible with CEO learning in deal making, and they propose a theoretical model of CEO decision making during corporate serial acquisitions in support of their argument. The ADR model starts by modeling the target valuation process. During the initial valuation stage, the acquirer CEO faces a trade-off between over- and under-evaluations, such that an over-evaluation creates ex-post disappointment and possible sanctions (e.g., dismissal), whereas an under-evaluation likely prevents the deal completion. The model allows for CEO learning through feedback received from financial markets, because the investor reactions to successive deal announcements provide signals that CEOs can use to update their beliefs about potential synergies with other targets. Therefore, the key hypothesis of the ADR model states that investor reactions to merger and acquisition (M&A) decisions enable the CEO to learn from experience and adapt bidding behavior in subsequent transactions. Finally, the model predicts that learning CEOs increase (decrease) their bidding aggressiveness from deal to deal after positive (negative) market reactions to previous acquisitions. We test this final prediction herein.

Several recent articles devoted to serial acquisitions note a commonly reported stylized fact, namely, the declining trend in acquirer cumulative abnormal returns (CARs) during M&A programs (Fuller et al., 2002; Conn et al., 2004; Croci, 2005; Ahern, 2008; Ismail, 2008), even after controlling for CEO effects (Billett and Qian, 2008). Fuller et al., (2002), Conn et al. (2004), Ismail (2008) and Billett and Qian (2008) interpret CARs that decline from deal to deal as a sign of CEO hubris. However, declining CARs are in fact compatible with several other explanations, including optimal target picking behavior (Ahern, 2008), time-varying investment opportunity sets (Klasa and Stegemoller, 2007), learning in deal making (see the ADR model), or even just budget-constrained acquirers.

To study CEO bidding behavior during corporate serial acquisition, we focus on a sample of CEOs who have undertaken two successive deals within a 12-month period between 1992 and 2007. The total

number of deals in our sample ranges from 520 to 630, and the CEO sample consists of 191–235 persons, depending on the measure of the bid premium we use. The aggregate deal value in our sample ranges from \$453 to \$589 trillion.

For our empirical approach, we focus on CEOs, not firms, because ADR consider learning at the CEO level (for similar approaches, see Billet and Qian, 2008; Croci, 2005). Moreover, we adopt a dynamic setup to explore the determinants of the bid premium. Specifically, the bid premium for the current deal is an explicit function of the bid premium from the previous deal. This autoregressive approach enables us to discriminate between learning and growing hubris, without relying on the use of some proxy for hubris. By avoiding hubris proxies, we eliminate error-in-variable problems (i.e., hubris proxies are often indirect measures, subject to measurement errors) and endogeneity issues (i.e., the direction of the causation between performance and hubris is not well established; the proxies may just pick poorly performing CEOs). Finally, we use a two-stage Heckman (1979) procedure to determine whether our results are robust to endogenous sample selection biases (see Li and Prabhala, 2007).

The results are consistent with learning. CEOs appear to acknowledge the signals investors send and dynamically adjust their bidding behavior from deal to deal. This dynamic adjustment behavior is economically significant: In reaction to a decrease of one standard deviation in abnormal returns during their previous deal announcement, CEOs typically reduce their bids by 2.73% in the subsequent deal. This shift corresponds to a percentage change of 8% from one deal to the next. We also obtain comparable results using the abnormal return premium (Schwert, 1996), the actual offer premium (Officer, 2003), and the four-week premium reported in the Thomson-Reuters SDC database. Our results thus are robust to the inclusion of control variables (e.g., payment mean, target size, acquirer and target Tobin's  $q$  ratios, deal relatedness, acquirer corporate governance quality, toehold, acquirer institutional holding, concentration). Furthermore, the results are robust to the time period chosen to identify successive deals undertaken by a given CEO–firm. Finally, we show that the CEO learning process appears related to the features of the CEO wage contracts and the importance of the variable component in their total compensation, a finding

compatible with the incentive role that CEO wage contracts can play in acquisition decisions (Datta et al., 2001).

Research on bid premium determinants is expansive, including the role of the target size, the target's book-to-market ratio, the target run up, the presence of a toehold, the acquirer's status (public or private), the payment mean, and the role of the termination agreement (for a review, see Eckbo, 2009). Our dynamic model of bidding behavior adds two dimensions to these results: (1) CEO bidding behavior is persistent, such that CEOs who bid high continue to bid high, and those who bid low continue to do so, and (2) CEOs adapt their bidding behaviors to signals sent by investors after their previous deal. These results emphasize the importance of the CEO factor and the role of learning in the context of bid premiums within the M&A setting.

Our study complements two previous articles that provide substantial evidence of learning from market reactions in the M&A setting. Luo (2005) shows that the probability of deal completion is a positive function of the market reaction to the deal announcement; Kau et al. (2008) document that managers listen to the market during M&As when they decide whether to consummate the deal. Moreover, the propensity of learning from financial markets is more important when managers' compensation is more sensitive to performance. We therefore study the impact of learning on the bidding behavior of acquirers to extend Luo's (2005) and Kau et al.'s (2008) analyses of the impact of learning on deal completion probability.

The remainder of this paper proceeds as follows: In Section 2, we briefly review recent contributions pertaining to corporate serial acquisitions, value creation effects, and acquirers' bidding behaviors. We then introduce the autoregressive model used to test the ADR model prediction. Section 3 describes our sample, variables, and empirical methods. We provide the results in Section 4, then finish with a conclusion and summary.

## **2. M&A programs and acquirers' bidding behaviors**

### **2.1. Value creation**

Schipper and Thompson (1983) early emphasized the repetitive nature of acquisitions, showing that acquisition program announcements can be value creating and introducing the concept of an acquisition program anticipation effect. Market reactions to subsequent deal announcements do not represent the full value created but instead are merely revisions of previous investor anticipations. Fuller et al. (2002), Conn et al. (2004), Croci (2005), Ahern (2008), Ismail (2008), and Billett and Qian (2008) all find a declining CAR trend during M&A programs. ). Fuller et al., (2002), Conn et al. (2004), Ismail (2008) and Billett and Qian (2008) interpret this clear empirical regularity as a sign of hubris, with the implicit assumption that hubris grows from deal to deal.

Croci (2005) uses performance persistence measures borrowed from performance attribution literature to reveal that neither performance persistence (good deals following good deals) nor performance reversals (bad deals following good deals) are statistically significant. Therefore, Croci (2005) concludes that CEOs neither possess superior target picking skills nor are systematically overconfident. Klasa and Stegemoller (2007) offer another argument: In studying the relation between growth opportunities and M&A sequences by individual bidders, they find that M&A sequences correlate with expansions of the investment opportunity set. The negative acquirer CAR trend observed ex-post therefore could reflect a declining investment opportunity set at the end of the M&A programs. Finally, Ahern (2008) develops a model of optimal target size choice by the acquirer, such that as acquirers grow larger, they tend to choose bigger targets in absolute size, though smaller in terms of relative size. This induces declining returns from deal to deal. Such empirical evidence supports the model predictions but provides no support for hubris or diminishing opportunity sets.

### **2.2. Determinants of takeover premiums**

Auction theory provides theoretical guidance for exploring acquirers' bidding behaviors, and related literature introduces models of jump-bidding (Fishman, 1988), toeholds (Burkart, 1995; Bulow et al.,

1999, Betton and Eckbo, 2000; Betton et al., 2009), overbidding as a consequence of the winner's curse (Roll, 1986), the choice of payment means in a context of asymmetric information (Hansen, 1987; Fishman, 1989, Eckbo et al., 1990; Dasgupta and Tsui, 2004; DeMarzo et al., 2005), features of (formal or informal) auctions by companies (Hansen, 2001), and M&A waves (Rhodes-Kropf and Viswanathan, 2004).

In particular, the bidding behavior of acquirers may be observed using takeover premiums. Extant literature documents a long list of determinants of bid premiums. In their synthesis of prior literature, Betton et al. (2008) analyze a sample of 4,889 control bids for U.S. targets during 1980–2002 to confirm the significant role of target size (i.e., the bigger the target, the lower the offer premium), the target book-to-market ratio (i.e., targets with book-to-market ratios higher than the industry median earn a higher offer premium), the target run up (i.e., the higher the run up, the higher the offer premium, which Schwert [1996] qualifies as markup pricing), the toehold (i.e., the higher the toehold, the lower the offer premium), the acquirer's status (i.e., public acquirers pay higher premiums), the deal type (i.e., premiums are lower for tender offers than for mergers), and the means of payment (i.e., cash deals are associated with higher premiums). Officer (2003) and Bates and Lemmon (2003) also study the role of termination agreements and show that premiums are higher in their presence. Some evidence indicates that a target CEO's entrenchment and power reduce takeover premiums (Hartzell et al., 2004; Moeller, 2005).<sup>1</sup> To the best of our knowledge though, the dynamics of acquirers' bidding behaviors and the impact of learning on premiums in the course of corporate serial acquisitions remain unexplored.

### 2.3. Acquirers' bidding behaviors: The ADR model

Do acquirers adapt their bidding behavior from deal to deal during serial acquisitions? Do they learn, or do they become increasingly infected by hubris? To address these questions, ADR introduce a theoretical model of CEO bidding behavior during M&A programs. An under-diversified, risk-averse CEO competes in the market for acquisitions and values potential synergies with possible targets, then

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<sup>1</sup> Because several of the determinants are endogenous choice variables (e.g., means of payments, toehold, termination agreements), Eckbo (2009) emphasizes the need for caution with regard to the robustness of some of the reported results.

attempts to buy those targets, whether through competitive bidding or direct bargaining. When evaluating potential synergies, the CEO maximizes his or her own utility function and thus faces a conundrum: If the valuation and offering price are too low, the takeover attempt will probably fail, but if the valuation and price are too high, the CEO risks some form of penalty imposed by angry shareholders in response to disappointing *ex-post* results. Learning thus enters the ADR model as a Bayesian updating process. That is, investor reactions to past deal announcements represent signals received by the CEO, which help her or him better assess future potential synergies with targets. With these market signals, the CEO can improve the accuracy of his or her evaluations from deal to deal. Using classical conjugate Bayesian inference results, ADR show that during the serial acquisition sequence, learning leads rational CEOs to increase their bidding aggressiveness after value-creating deals but behave more conservatively after value-destroying deals. These results can be summarized as in Equation (1):

$$\frac{\partial \beta_t^*(v_t^*(SCAR_{t-1}))}{\partial SCAR_{t-1}} = \frac{\partial \beta_t^*(v_t^*)}{\partial v_t^*} \times \frac{\partial v_t^*(SCAR_{t-1})}{\partial SCAR_{t-1}}, \quad (1)$$

where  $\beta_t^*$  is the equilibrium bid,  $v_t^*$  is the CEO valuation of the target (obtained by maximizing the CEO utility function),  $SCAR$  is the signal sent by investors,<sup>2</sup> and  $t$  and  $t - 1$  designate the current and previous deals undertaken by the CEO, respectively.

The essential ingredients of the ADR model thus are as follows:

- $\partial \beta_t^*(v_t^*) / \partial v_t^* > 0$ , because in equilibrium, the CEO's bidding increases with the valuation of the target. This mechanism translates learning into more aggressive bidding.
- $\partial v_t^*(SCAR_{t-1}) / \partial SCAR_{t-1} > 0$ , such that the CEO target valuation is a positive function of market signals. Through this Bayesian updating process, the CEO incorporates information sent by investors.

We test whether CEOs learn from deal to deal by using a dynamic regression equation to model their bidding behaviors. The specific regression equations vary from test to test, but the general form of these regression equations complies with the following equation:

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<sup>2</sup>  $SCAR$  refers to standardized cumulated abnormal returns (see Section 3).

$$Premium_{i,t} = \alpha_0 + \alpha_1 Premium_{i,t-1} + \alpha_2 (Premium_{i,t-1} \times SCAR_{i,t-1}) + \beta Control_{i,t} + \varepsilon_{i,t}, \quad (2)$$

where *SCAR* is the signal sent by investors, *Control* is the standard set of control variables commonly employed in the M&A literature to predict target premiums, *t* and *t* – 1 designate the CEO’s current and previous deals, and *i* is the CEO index. As the main empirical implication of Equation (1), we expect  $\alpha_2$  to be positive in Equation (2), because:

- When investor reactions to the previous deal are positive, the bidding aggressiveness of the learning CEO increases.
- When investor reactions to the previous deal are negative, the learning CEO becomes more conservative and reduces bidding aggressiveness.

We also introduce an interaction term between the bid premium from the previous deal and market signals, that is,  $(Premium_{i,t-1} \times SCAR_{i,t-1})$ , because we intuitively expect that the sensitivity of the CEO to investor reactions depends on her or his bidding aggressiveness. The interpretation of  $\alpha_2$  is ambiguous when the previous deal premium is negative, but the fraction of negative premiums is quite small in our sample (i.e., between 2% and 13%, depending on the premium measure). We obtain similar results when we use  $SCAR_{i,t-1}$  without interacting it with the previous deal premium.

This dynamic model of the CEO’s bidding behaviors offers two main benefits in terms of testing the learning hypothesis introduced by ADR. First, the prediction about  $\alpha_2$  is specific to the learning hypothesis. A positive  $\alpha_2$  coefficient is incompatible with growing hubris, because hubris-infected managers do not care about market reactions (e.g., Roll, 1986; Jennings and Mazzeo, 1991; Kau et al., 2008), whereas an increase in bidding aggressiveness from deal to deal (positive  $\alpha_1$  coefficient) is compatible with both learning and growing hubris. Alternative arguments about the pattern of value creation from deal to deal offer no predictions about  $\alpha_2$ . In particular, Ahern’s (2008) optimal target size choice argument indicates nothing about the relation between CEO bidding behavior and investor reactions to previous deal announcements. Klasa and Stegemoller’s (2007) time-varying investment opportunity set theory also is silent with respect to this dimension of CEO bidding behavior.

Our empirical design is closer to Luo's (2005) and Kau et al.'s (2008); they analyze the relationship between investor reactions at the announcement of a deal and the probability of deal completion. Unlike those investigations though, we focus on the bid premium, not the probability of deal completion, and as market signals, we use investor reactions to the CEO's previous, not concurrent, deal announcement.

Second, our Equation (2) does not rely on an *ex ante* identification of hubris-infected CEOs, because the prediction of  $\alpha_2$  is specific to the learning argument. Our approach, in this respect, is free of the main weaknesses of most hubris proxies, namely, errors-in-variables (i.e., hubris by its very nature is not observable, and any proxy offers at best a noisy variable correlated with the latent hubris factor), ambiguity (are hubris proxies correlated with the psychological trait of interest, or do they just capture poorly performing CEOs?), and endogeneity (do the proxies capture hubris, or does the anticipation of future results drive the results?).

Predictions about the  $\alpha_1$  coefficient from Equation (2) are more ambiguous. With learning, we expect a positive  $\alpha_1$ , but this expectation is also compatible with growing hubris. A strict increase in bidding aggressiveness actually implies  $\alpha_1 > 1$ , which would lead to an explosive representation of CEO bidding behavior from deal to deal. When  $\alpha_1$  falls between 0 and 1, the CEO bidding behavior is persistent, such that CEOs who bid high continue to bid high. This result demonstrates the importance of taking into account the CEO effect when analyzing acquirer bidding behavior during corporate serial acquisitions, though it does not provide clear-cut conclusions about learning.

### **3. Variables, sample, and empirical methods**

#### **3.1. Variables**

*Bid premium.* Our analyses focus on CEO bidding behavior. We use three measures of the bid premium as the dependent variable: the abnormal return (AR) premium (Schwert, 1996), and two offer premiums computed using information from the Thomson-Reuters SDC database, that is, the actual offer premium (see Officer, 2003; Gaspar et al., 2005) and the four-week premium.

The AR premium equals the target cumulative abnormal returns from day  $-42$  to the delisting date or to day  $+126$  relative to the announcement date. To compute the daily abnormal returns, we use the Beta-one model, which subtracts the daily market portfolio return from the daily return of each company (using a classical market model does not alter our results). As the market portfolio, we use the daily value-weighted CRSP index, and stock prices come from the CRSP database.

We compute the two SDC premiums as follows: The actual offer premium is the ratio of the total consideration offered relative to the target market value estimated 42 days before the announcement date, adjusted to account for the percentage of shares acquired. The four-week premium is the premium as a percentage, defined as the share price offered by the winning bidder relative to the price of the target four weeks prior to the announcement date.

*Market signals.* The market signals measure equals the standardized cumulative abnormal return of the acquirer around the previous deal announcement (*SCAR*). Similar to our calculation of the AR premium, we compute acquirer CARs using the Beta-one model (Fuller et al., 2002). Our event window spans day  $-5$  to day  $+5$ , relative to the announcement date. To capture the strength of the signal sent by investors, we standardize the CAR by its standard deviation. The CAR standard deviation corresponds to the square root of eleven times the variance of the daily abnormal returns estimated from day  $-242$  to day  $-43$ , relative to the announcement date.

### 3.2. Sample description

We are interested in dynamic bidding behavior by the CEO during corporate serial acquisition sequences. Our analysis thus focuses on CEO–firm couples, that is, an individual CEO at a particular firm. We define an observation as a sequence of two successive deals completed by the same CEO–firm within a certain time period. A sequence starts with the first deal by the CEO and ends after the second deal or after 12 months, relative to the month of the first deal. Only sequences of two deals appear in the sample. When a sequence ends, another sequence starts with the next first deal of the CEO, and so forth. We refer to the CEO–firm hereafter using the generic term of CEO.

To form our sample of observations, we first extract from the Thomson-Reuters SDC database 5,912 completed M&A transactions that satisfy the following criteria:

1. Deal is announced in the period 1992–2007;
2. Both the target and the bidder are listed U.S. firms;
3. The deal size is greater than \$1 million and equal to at least 1% of the acquirer’s market value (see Masulis et al., 2007); and
4. The necessary information is available in the CRSP database for both the acquirers and the targets (i.e., prices, number of shares, and returns).

Next, we select all CEOs identified in the Compustat ExecuComp database during the period 1992–2007, which includes 5,902 such individuals. Using this list of CEOs and our initial sample of M&As, we identify all cases in which the same CEO makes two successive deals during a time period not exceeding 12 months (we also report results using 6- and 24-month time frames).

Our sample size depends on the availability of the AR premium, the offer premium, and the four-week premium;<sup>3</sup> in Table 1, we outline the sample distribution by year. When we use the AR premium, we can identify 315 observations (i.e., 315 CEO–firm couples that make two successive deals within a 12-month time frame). These 315 successive deals have been realized by 235 different CEOs. With the actual offer premium, the sample includes 260 sequences of two deals undertaken by 191 unique CEOs, and the four-week premium sample includes 284 sequences by 212 unique CEOs. The median deal value falls between \$363 and \$383 million, depending on the definition of the bid premium, and the corresponding average deal value is \$1.8–\$2 billion (which indicates the presence of a few large transactions). The M&A wave at the end of the 1990s is clearly apparent, as is the M&A market revival during 2004–2005.

In Table 2, we report the averages and medians of our three premium measures and acquirer announcement CARs for the two successive transactions undertaken by a given CEO within a 12-month time frame. The average AR premium is 32.33%, whereas Schwert (1996) and Gaspar et al. (2005) report

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<sup>3</sup> In the multivariate analyses, the availability of some control variables imposes further constraints on the size of our samples.

average AR premiums of 23% (1975–1991) and 23.4% (1990–1999), respectively. But their samples include both successful and unsuccessful transactions, whereas our sample is limited to completed transactions. This distinction may explain the difference in the average premium reported. The average actual offer premium is 67.84% in our sample, slightly higher than the average premium reported by Officer (2003), who finds an average of 63.41% for a sample of 2,511 successful and unsuccessful acquisition bids during 1988–2000. The average four-week premium is 40.82% in our sample. Datta et al. (2001) and Boone and Mulherin (2007) report similar magnitudes for samples of 628 takeovers (1993–1998) and 308 takeovers (1989–1999), respectively. Consistent with prior literature, the average AR premium in our sample is substantially lower than the averages obtained with the two SDC premiums, because the AR premium reflects not only the offer price but also the likelihood of a completed acquisition (Eckbo, 2009). Since premiums differ substantially from one measure to the next, we report our results systematically using all three definitions of the premium as a robustness check.

Finally, the current deal premium (deal  $t$ ) is on average lower than the previous deal premium (deal  $t - 1$ ), but the difference is not statistically significant, regardless of the definition of the premium we use.

We also include the fraction of negative premiums and acquirer CARs for the current and previous deals in Table 2. The fraction of negative premiums is more important for the abnormal return-based premium (13.33% of previous deal premiums are negative) compared with the premium measures from SDC database (between 2.30% and 3.84%). With regard to market signals (CAR), 55% of the previous deal CARs are negative. The proportion of negative market feedback is slightly more important than the proportion of positive market feedback following acquisition announcements.

### 3.3. Empirical methods

We apply some generic choices to all our empirical analyses. To avoid feedback effects, we calculate financial ratios at the end of the year, prior to the year of the acquisition announcement. Financial ratios frequently exhibit large outliers (especially when the book value of equity is the denominator). To mitigate these potential pitfalls, we winsorize the financial ratios at the 1st and 99th percentiles.

For industry-related variables, we use the Fama-French 49 industry classification scheme and obtain standard industrial classification (SIC) codes from the CRSP database, which we convert using the table that Kenneth French provides on his Internet site.<sup>4</sup> The Fama-French 49 industry classification scheme offers some balance across the number of industries, the number of firms within each industry, and the homogeneity of the intra-industry economic activity. These are important concerns when controlling for industry-related determinants of market reactions to M&A announcements.

For the statistical test of significance, all reported  $p$ -values come from a bootstrap procedure. We use a percentile- $t$  approach, based on case-by-case resampling (Efron and Tibshirani, 1993). From the original data matrix, we draw, with replacements, 1,000 bootstrap samples with the same number of observations as in the original sample. For each bootstrap sample, we run the regression with White-adjusted standard errors to obtain the heteroskedastic robust Student  $t$ -statistic of the coefficients for the bootstrap samples. The adjusted bootstrap  $t$ -statistics provide the empirical distribution for comparison against the  $t$ -statistic obtained from the original data. This procedure produces bootstrap  $p$ -values robust against heteroskedasticity.

Our multivariate analyses are exposed to two econometric difficulties. First, in relation to the panel data structure of our sample, some CEOs undertake several sequences of two successive deals (e.g., in Panel A of Table 1, 191 CEOs undertake 260 sequences of two acquisitions within 12 months). These observations cannot be considered independent. A classical solution would adopt a panel data estimator to adjust the point estimates and standard errors for the correlation among observations. However, because the number of observations by CEO is very limited (on average, we have 1.4 sequences of two deals per CEO in Panel A of Table 1), a panel data estimator would reduce the power of our multivariate analyses, especially if we used a fixed effect estimator, which would cause losses in the degrees of freedom. As robustness checks, we also report results for a subsample of observations in which each CEO appears only once.

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<sup>4</sup> [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

Second, because we focus on completed M&A transactions, endogenous sample selection might affect our analysis. Completed deals involve only auction winners, which may be more talented or more hubris-infected than are CEOs who fail to complete an acquisition (Roll, 1986). In our case, this possibility is exacerbated by our focus on CEOs who realize two successive, significant transactions in a limited time frame. We follow Li and Prabhala (2007) and adopt Heckman's (1979) classical two-stage procedure to account for sample selection.

In the first stage, we model the probability that a given CEO will realize a M&A transaction during a given year using a Probit specification. We then introduce the inverse Mills ratio (or Heckman's Lambda) in the second stage regression to control for endogenous sample selection. To adjust standard errors in the second-stage regression, we use the procedure described by Greene (2008).

## **4. Results**

### **4.1. Main results**

We present our main multivariate results in Table 3. The dependent variable is the bid premium in all specifications. Column 0 of Table 3 includes, for the purposes of comparison with prior literature, only the control variables (see the Appendix for the variable definitions). Consistent with existing literature, we find that the target's premium relates negatively to the target's size and the bidder's toehold (e.g., Officer, 2003; Gaspar et al., 2005; Betton et al., 2009; Eckbo, 2009). We also find that acquirers with high Tobin's  $q$  ratios pay higher premiums, and acquirers with high managerial power (low GIM index) and institutional ownership pay lower premiums.

Columns 1–6 of Table 3 focus on the determinants of the CEO's second deal bid premium in a sequence of two deals. We retain 12 months as the time frame to identify the two-deal sequence. For each premium definition, we report the results without and with the set of control variables. Columns 1–2 use the AR premium; columns 3–4 contain the actual offer premium, and columns 5–6 show the four-week premium.

Whatever the premium definition and without or with control variables, the coefficient of the previous deal premium ( $Premium_{t-1}$ ) is always positive, statistically significant, and far less than 1. In addition, CEO bidding behavior is persistent, such that CEOs who bid high continue to bid high, but those who bid low keep bidding low. The acquirer's bidding behaviors vary clearly from CEO to CEO, a result consistent with either hubris or learning (see Section 2). The CEO bidding behavior appears not to be explosive though; a back-of-the-envelope calculation shows for example that the expected AR premium in the current deal (without control variables and using the sample averages in Table 2) is approximately 32.39% with a sample average of 34.13% for the previous deal.

The coefficient of the interaction term between the CEO's previous deal premium and market signals for the previous deal is significantly positive and robust against the various definitions of the premium and the inclusion of control variables. When investors react positively to the CEO's previous deal announcement ( $SCAR > 0$ ), the CEO bids more aggressively during the current deal relative to the previous deal. When investors sanction the previous deal ( $SCAR < 0$ ), the CEO bids more conservatively relative to the previous deal. These results are economically significant. For example, for the AR premium, a decrease of one standard deviation in abnormal returns for the previous deal leads the CEO to reduce the bid premium for the current deal by approximately 2.73%.<sup>5</sup> This amount corresponds to a percentage change of 8% with respect to the previous deal by that CEO.

To emphasize the economic significance of our results, we estimate the change in AR premium from one deal to another, conditional on the sign of the market signal at the previous deal ( $SCAR$ ) and find:

- Conditional on a negative signal from the previous deal, the estimated AR premium in the current deal is 28.29%. This level represents a percentage change of  $-21.03\%$  with respect to the 34.13% average premium of the previous deal.

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<sup>5</sup> We obtain this number by multiplying the coefficient of the interaction variable in column 1 of Table 3 by the average premium of the previous deal times minus 1:  $[0.08 \times 34.13\% \times (-1)]$ .

- Conditional on a positive signal from the previous deal, the estimated AR premium in the current deal is 37.47%, a percentage change of 9.78% with respect to the 34.13% average premium of the previous deal.

These results clearly support learning; the CEO's bidding increases following positive investor reactions and decreases following negative feedbacks from market participants.

With regard to the control variables, only target size retains its sign and significance for the different measure of the bid premiums in columns 1–6. The other control variables are either not significant or do not retain their significance across the different bid premium measures. These differences with respect to the results reported in prior literature may reflect our use of an autoregressive model that already implicitly controls for the determinants of the previous deal premium.

Even if the results in Table 3 provide substantial support to the learning concept, we must tackle some additional issues to confirm the robustness of our results. Are the results influenced by endogenous sample selection? Are the reported  $p$ -values biased by the presence of multiple sequences (i.e., of two deals) by the same CEOs? Do the results depend on the time frame (12 months) chosen to identify successive deals by the same CEO? Is there any interaction between learning and the CEO's compensation package? We explore these questions next.

#### 4.2. Additional analyses

*Endogenous sample selection.* Most CEOs who engage in M&A transactions are economically motivated agents making voluntary decisions (see Li and Prabhala, 2007). Our sample moreover consists of CEOs undertaking two deals consecutively in a time frame not exceeding 12 months. Such a sample definitively is not random across the population of CEOs, which might affect our results?

Therefore, in Table 4, we report results from the use of the classical Heckman two-stage procedure to control for (potentially) endogenous sample selection (Heckman, 1979). In the first stage, we model the probability that a given CEO will perform a M&A transaction in a given year using a Probit model. We use the list of CEOs identified in the ExecuComp database for the period 1992–2007 and the sample of M&As described in Section 3.2. The dependent variable is a dummy variable that equals 1 when a given

CEO completes a deal in a given year. The independent variables include size (because acquirer firms are known to be larger than target firms), the leverage and liquidity ratio (because financially constrained firms should be less likely to undertake acquisitions), the market-to-book ratio (Shleifer and Vishny, 2003), the liquidity index (which captures the intensity of inter-corporate transactions at the industry level and correlates with M&A waves, Schlingemann et al. [2002]), and the number of deals completed by the CEO–firm in the previous 24 months (e.g., Schipper and Thompson, 1983; Malatesta and Thompson, 1985; Fuller et al., 2002).<sup>6</sup> The first-stage probit allows us to compute Heckman’s Lambda. In the second stage, we include Heckman’s Lambda (also known as the inverse Mills ratio) in the ordinary least squares regression to control for sample selection. The estimation of the first-stage probit is not reported herein.<sup>7</sup>

Table 4 replicates the set of estimations from Table 3. The coefficient of the previous deal premium variable is again positive and statistically significant for all premium measures. The point estimates are close to those reported in Table 3. The same conclusions hold for the interaction variable between previous deal premium and *SCAR*, confirming again the role of learning in CEOs’ bidding behaviors. The introduction of Heckman’s Lambda does not significantly affect the conclusions pertaining to the control variables, though the target Tobin’s *q* ratio appears somewhat more significant. Finally, sample selection does not appear to be an issue in our case (Heckman’s Lambda coefficient is never significant).

*CEO effect.* Some CEOs in our samples undertake more than one sequence of two deals. For the AR premium, the sample encompasses 315 observations for 235 unique CEOs, or an average of 1.34 sequences of two deals per CEO (see Section 3.2). We attain similar ratios of CEOs to observations for the two SDC-based premiums. However, the presence of several sequences completed by the same CEO in the sample may create correlations among the observations and bias our statistical test. Although a classical approach to deal with this issue would use a panel data estimator (e.g., fixed effect estimator), in

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<sup>6</sup> Size is the natural logarithm of the firm market value. Leverage is the ratio of long-term and current liabilities to total assets. The liquidity ratio is the ratio of cash to total assets. The market-to-book ratio is the ratio of the market value of equity to the book value of equity. The liquidity index is the value of corporate control transactions during a year, relative to the aggregate book value of assets of firms in each Fama/French industry.

<sup>7</sup> The estimation of the first-stage probit is available upon request.

our case, the number of repeated observations by CEOs is very low. So using the estimator would mean a strong loss of power in the statistical test due to the fewer degrees of freedom. Instead, we report in Table 5 the results obtained for a subsample of observations in which each CEO appears only once. When a given CEO appears several times in our initial sample, we keep only the first (in calendar time) observation. This procedure reduces our sample sizes substantially (e.g., for the AR premium and without control variables, our sample size falls from 315 observations to 163).

The results in Table 5 confirm the significant and positive coefficients of the previous deal premium variable and its interaction with *SCAR*. The statistical significance of the interaction variable between the previous deal premium and *SCAR* is reinforced (cf. the four-week premium with control variables in column 6). The role of learning also receives confirmation from a subset of observations in which a given CEO appears only once. The result suggests that the correlation among observations due to the CEO effect influences our results, but the bias actually plays against the learning hypothesis (Tables 3 and 4).

*Time frame.* We define an observation unit as two successive M&A transactions realized by a given CEO–firm in a given time frame (12 months). Do the results depend on the time frame we choose? In Table 6, we report the results when we use 6-month (Panel A) and 24-month (Panel B) time frames. Column 1 contains the AR premium, column 2 the actual offer premium, and Column 3 features the four-week premium. We do not include the control variables in the specifications in Table 6, because their inclusion does not alter the results. The results in Panel A of Table 6 are consistent with the results in Table 3, in that the coefficient of the previous deal premium and its interaction with *SCAR* is always positive and significant. The role of learning also receives confirmation, despite the significant sample size reduction generated by shortening the time frame (e.g., for the AR premium, we move from 315 observations in Table 3 to 174 observations in Table 6).

In Panel B of Table 6, we use a 24-month time frame, which increases the sample size (e.g., for the AR premium, we increase from 315 observations to 468). The coefficient of the previous deal premium remains positive and significant in the three specifications, though interaction with *SCAR* clearly loses some significance. The interaction variable thus is only significant for the AR premium and the four-week

premium, but at the 10% confidence level. Nor is the interaction variable significant for the actual offer premium (i.e., the  $p$ -value declines from 0.05 in Table 3 to 0.21 in Table 6). The persistent nature of the CEO's bidding behavior thus is confirmed, but the role of learning seems to weaken when we increase the time frame for successive deals. As Hayward (2002) emphasizes, waiting too long between successive acquisitions may hamper organizational learning, a point that appears true at the CEO level.

*Learning and CEO incentives.* Datta et al. (2001) report a strong relation between the CEO's compensation structure and corporate acquisition decision performance, such that CEOs with higher equity-based compensation pay lower premiums, acquire targets with more growth opportunities, and create more value after the acquisition. Grinstein and Hribar (2004) find a positive relationship between cash bonuses paid to CEOs for acquisitions and measures of effort, though these cash bonuses do not appear to be related to deal performance. Kau et al. (2008) also show that the likelihood of deal cancellation (or consummation) following negative (positive) announcement abnormal returns is higher when managers' compensation is more sensitive to performance. Following these results, we analyze whether the structure of the compensation contract affects the CEO's learning process in serial acquisitions. Our empirical set up allows for such an investigation.

We define the variable *CEO incentive* as the ratio of the CEO's variable remuneration (options awarded, bonuses, and stocks granted) to the CEO's total remuneration, according to Compustat ExecuComp. The CEO incentive variable interacts with the cross-product between-deal premium and *SCAR* to form a new variable. We then add this new variable as an additional explanatory variable in Equation 2 to form the following model:

$$Premium_{i,t} = \alpha_0 + \alpha_1 Premium_{i,t-1} + \alpha_2 (Premium_{i,t-1} \times SCAR_{i,t-1}) + \alpha_3 (Premium_{i,t-1} \times SCAR_{i,t-1} \times CEO Incentive) + \beta Control_{i,t} + \varepsilon_{i,t}. \quad (3)$$

As the results in Table 7 reveal, including the new variable affects the impact of the interaction variable between previous deal premium and *SCAR* on the bid premium. The coefficient  $\alpha_2$  is not significant at conventional levels in five of six specifications in Table 7; it is only significant at the 8% level in column 2. The coefficient of the new variable ( $\alpha_3$ ) is statistically significant in three specifications, which suggests

to some extent that the learning process in serial acquisition is sensitive to the CEO's incentive package. Consistent with Kau et al. (2008), CEOs with large variable components appear to pay more attention to market reactions after they have already undertaken acquisition decisions.

## **5. Conclusion**

Recent academic studies indicate that acquirers' CARs decline from deal to deal in M&A programs. How can we interpret such empirical evidence? The question is one of importance. Toward the end of the 1990s, at the crest of the M&A wave, the aggregate deal value of year 2000 acquisitions initiated by U.S. bidders reached \$1.1 trillion. With a total market capitalization (NYSE, AMEX, and NASDAQ) of approximately \$15.5 trillion at the end of the same year, acquisitions amounted to roughly 7% of total market capitalization. Might such a huge economic restructuring process result, on average, from hubris-infected CEOs? Why would important economic decision makers be so prone to irrationality?

In response, ADR provide an alternative explanation, based on CEO learning through the acquisition sequence. We test the main implication of the learning hypothesis, which states that through a Bayesian updating procedure, learning CEOs increase their bidding aggressiveness from deal to deal after positive investor reactions to previous acquisitions and adopt a more conservative approach after negative investor reactions to previous acquisitions.

Our empirical evidence derives from a sample of successive deals realized by the same CEO during a 12-month time frame during 1992–2007. We estimate a dynamic model of the CEO's bidding behavior by conditioning the bid premium in the current deal to (1) the bid premium in the previous deal and (2) the interaction between the bid premium for and the investor reactions to the previous deal. We obtain results consistent with the learning hypothesis.

Our results also emphasize the persistence of the CEO bidding behavior: CEOs who bid high continue to bid high (and vice-versa). Bidding persistence is a source of heterogeneity in the CEOs' bidding behaviors ignored up to now in the literature. We finally explore the interaction between CEO learning

and the CEO compensation contract structure and provide some evidence that the incentives received by the CEO is one of the factor driving learning.

## Appendix: Variable definitions

(Compustat is the source of variables referred to by item number)

| Variable                    | Description  |
|-----------------------------|--|
| <i>Dependent Variable</i>   |  |
| Actual Offer Premium        | The ratio of the total consideration offered relative to the target market value estimated 42 days before the announcement date, adjusted to take into account the percentage of shares acquired (source: Thomson-Reuters SDC).  |
| Four-Week Premium           | The share price offered by the winning bidder to target shareholders deflated by the price of the target four weeks prior to the announcement date (source: Thomson-Reuters SDC database).   |
| Abnormal Return Premium     | The sum of the target daily abnormal returns (AR) from day -42 to the delisting date or to day 126 relative to the announcement date. Daily ARs are from the Beta-one model, which subtracts the daily market portfolio return from the daily return of each company. The selected market portfolio is the daily value-weighted CRSP index.  |
| <i>Market Signals</i>       |  |
| SCAR                        | The acquirer's standardized CARs from day -5 to day +5, relative to the announcement date of the previous deal. Daily abnormal returns are computed following the same method as that for the abnormal return premium. The standard deviation used to standardize the CAR corresponds to eleven times the variance of the daily abnormal returns from day -242 to day -43, relative to the announcement date |
| <i>Control Variables</i>    |  |
| Stock                       | Dummy variable: 1 for purely stock-financed deals, 0 otherwise.  |
| Target Size                 | Natural logarithm of the market value of equity (number of shares outstanding multiplied by the stock price) at day -42 relative to the announcement date.   |
| Tobin's <i>q</i> Ratio      | Market value of assets over book value of assets: (item6 - item60 + item25 × item199) / item6.   |
| Toehold                     | Percentage of target stocks held by the acquirer prior to the announcement date.   |
| Related Deal                | Dummy variable: 1 for deal in which both the bidder and the target are in the same Fama-French industry. We use the Fama-French 49 industry classification scheme, after obtaining SIC codes from the CRSP database and converting them using the table provided by Kenneth French on his Web site. <sup>8</sup>   |
| GIM Index                   | To proxy for the acquirer's corporate governance quality, we use the Gompers et al.'s (2003) index, which is constructed using information from the Investor Responsibility Research Center (IRRC) database. Higher index levels correspond to more managerial power.  |
| Institutional Ownership     | Percentage of target firm's equity owned by institutional investors, as in Gaspar et al. (2005), using SDA/Spectrum as database. The variable is lagged by two quarters with respect to the deal announcement quarter.   |
| Institutional Concentration | Herfindahl index of the institutional investors shareholdings in the target, as in Gaspar et al. (2005), using SDA/Spectrum as data source. The variable is lagged by two quarters with respect to deal announcement quarter.  |
| CEO Incentive               | The ratio of the CEO variable remuneration (options awarded, bonuses, and stocks granted) to the CEO total remuneration, using Compustat ExecuComp as data source. The ratio is measured at the end of the year prior to the year of the acquisition announcement.   |

<sup>8</sup> [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

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Table 1  
Sample distribution by announcement year

This table reports the number of observations ( $N$ ) and average deal size (million \$) per year for the three bid premium definitions (see the Appendix for the variable definitions). An observation is a sequence of two successive deals undertaken by the same CEO–firm within a 12-month time frame. If the two successive deals are spread over two years, the year of the observation is the year of the more recent deal. *Unique CEO* gives the total number of unique CEO–firm couples completing two successive deals at least once within a 12-month period.

| Year       | Panel A                 |           | Panel B              |           | Panel C           |           |
|------------|-------------------------|-----------|----------------------|-----------|-------------------|-----------|
|            | Abnormal Return Premium |           | Actual Offer Premium |           | Four-Week Premium |           |
|            | N                       | Deal Size | N                    | Deal Size | N                 | Deal Size |
| 1992       | 4                       | 97        | 1                    | 68        | 4                 | 97        |
| 1993       | 12                      | 165       | 12                   | 165       | 11                | 169       |
| 1994       | 20                      | 419       | 16                   | 293       | 10                | 246       |
| 1995       | 22                      | 569       | 14                   | 286       | 12                | 454       |
| 1996       | 30                      | 525       | 22                   | 342       | 27                | 508       |
| 1997       | 40                      | 1,745     | 33                   | 677       | 39                | 1,761     |
| 1998       | 32                      | 5,080     | 28                   | 5,053     | 31                | 5,229     |
| 1999       | 54                      | 2,214     | 47                   | 2,394     | 52                | 2,255     |
| 2000       | 28                      | 2,807     | 26                   | 2,694     | 31                | 2,683     |
| 2001       | 13                      | 1,199     | 10                   | 1,085     | 13                | 1,137     |
| 2002       | 9                       | 1,013     | 6                    | 1,288     | 6                 | 1,306     |
| 2003       | 14                      | 670       | 14                   | 670       | 13                | 480       |
| 2004       | 15                      | 856       | 13                   | 934       | 13                | 912       |
| 2005       | 8                       | 1,920     | 6                    | 1,912     | 9                 | 2,566     |
| 2006       | 10                      | 5,301     | 9                    | 5,875     | 9                 | 5,429     |
| 2007       | 4                       | 1,283     | 3                    | 840       | 4                 | 1,283     |
| Total      | 315                     |           | 260                  |           | 284               |           |
| Unique CEO | 235                     |           | 191                  |           | 212               |           |
| Average    |                         | 1,873     |                      | 1,814     |                   | 2,017     |
| Median     |                         | 369       |                      | 363       |                   | 383       |

Table 2  
Summary statistics

This table reports the sample period means and medians for the three premium definitions and the acquirer's cumulative abnormal returns (see the Appendix for the variable definitions). The indices  $t$  and  $t-1$  denote, respectively, the current and previous deal by a given CEO in a sequence of two deals undertaken within 12 months. The final column displays the  $p$ -value from a different of means test.  $N$  and %Negative denote the number of observations and the proportion of negative values in the sample for the corresponding variable, respectively.

|   | Deal $t$ | Deal $t-1$ | $p$ -value |
|---|----------|------------|------------|
| Panel A. Abnormal Return Premium          |          |            |            |
| N   | 315      | 315        |            |
| Mean                                      | 32.33%   | 34.13%     | 0.68       |
| Median                                    | 28.11%   | 29.62%     |            |
| %Negative                                 | 12.06%   | 13.33%     |            |
| Panel B. Actual Offer Premium ( $N=260$ ) |          |            |            |
| N   | 260      | 260        |            |
| Mean                                      | 67.84%   | 71.97%     | 0.54       |
| Median                                    | 53.88%   | 56.59%     |            |
| %Negative                                 | 2.30%    | 3.40%      |            |
| Panel C. Four-Week Premium ( $N=284$ )    |          |            |            |
| N   | 284      | 284        |            |
| Mean                                      | 40.82%   | 43.20%     | 0.54       |
| Median                                    | 35.33%   | 35.93%     |            |
| %Negative                                 | 3.87%    | 2.82%      |            |
| Panel D. Acquirer CAR ( $N=381$ )         |          |            |            |
| N   | 381      | 381        |            |
| Mean                                      | -1.10%   | -0.12%     | 0.24       |
| Median                                    | -1.31%   | -0.78%     |            |
| %Negative                                 | 58.53%   | 54.86%     |            |

Table 3  
Explaining the bid premium with market signals: OLS regression

The dependent variable is the bid premium. An observation is a sequence of two successive deals undertaken by the same CEO–firm within a 12-month time frame. Column 0 includes only the control variables in the specification. For each premium definition, we provide a model without and with control variables. Variable definitions are in the Appendix.  $R^2$  and  $F$ -Statistic denote the r-square and the Fisher statistic for the regression, respectively.  $P$ -values are obtained using the bootstrap procedure described in Section 3.3 and reported in parentheses underneath the coefficient estimates.

| Dependent Variable   | Abnormal Return Premium |                 |                  | Actual Offer Premium |                  | Four-Week Premium |                  |
|--|-------------------------|-----------------|------------------|----------------------|------------------|-------------------|------------------|
|  | (0)                     | (1)             | (2)              | (3)                  | (4)              | (5)               | (6)              |
| Intercept  | 0.745<br>(0.00)         | 0.227<br>(0.00) | 0.604<br>(0.00)  | 0.498<br>(0.00)      | 0.993<br>(0.00)  | 0.334<br>(0.00)   | 0.480<br>(0.00)  |
| Premium <sub><i>t</i>-1</sub>                              |                         | 0.275<br>(0.00) | 0.213<br>(0.00)  | 0.255<br>(0.00)      | 0.201<br>(0.00)  | 0.175<br>(0.00)   | 0.125<br>(0.04)  |
| Premium <sub><i>t</i>-1</sub> x SCAR <sub><i>t</i>-1</sub> |                         | 0.080<br>(0.04) | 0.151<br>(0.00)  | 0.056<br>(0.05)      | 0.055<br>(0.07)  | 0.037<br>(0.08)   | 0.064<br>(0.00)  |
| Stock  | -0.002<br>(0.88)        |                 | 0.008<br>(0.72)  |                      | -0.054<br>(0.24) |                   | 0.030<br>(0.32)  |
| Target Size  | -0.056<br>(0.00)        |                 | -0.048<br>(0.00) |                      | -0.059<br>(0.00) |                   | -0.030<br>(0.03) |
| Acquirer Tobin's $q$                                       | 0.040<br>(0.00)         |                 | 0.028<br>(0.09)  |                      | 0.032<br>(0.17)  |                   | 0.029<br>(0.08)  |
| Target Tobin's $q$   | -0.004<br>(0.59)        |                 | 0.021<br>(0.11)  |                      | 0.065<br>(0.01)  |                   | 0.023<br>(0.15)  |
| Toehold  | -0.123<br>(0.02)        |                 | -0.127<br>(0.15) |                      | 0.154<br>(0.23)  |                   | -0.005<br>(0.94) |
| Related Deal   | 0.003<br>(0.83)         |                 | -0.001<br>(0.95) |                      | -0.032<br>(0.47) |                   | -0.030<br>(0.38) |
| Acquirer GIM Index   | -0.009<br>(0.00)        |                 | -0.010<br>(0.18) |                      | -0.023<br>(0.03) |                   | -0.006<br>(0.28) |
| Acquirer Inst. Ownership                                   | -0.082<br>(0.02)        |                 | 0.002<br>(0.95)  |                      | -0.180<br>(0.05) |                   | 0.056<br>(0.24)  |
| Acquirer Inst. Concentration                               | 0.006<br>(0.98)         |                 | -1.266<br>(0.01) |                      | 0.177<br>(0.76)  |                   | -0.301<br>(0.36) |
| Number of observations                                     | 885                     | 315             | 194              | 260                  | 174              | 284               | 168              |
| Adjusted- $R^2$  | 10.91%                  | 10.1%           | 26.6%            | 9.2%                 | 24.9%            | 5.2%              | 15.7%            |
| $F$ -Statistic   | 11.90                   | 17.51           | 5.98             | 13.01                | 4.89             | 7.66              | 2.64             |

Table 4  
Explaining the bid premium with market signals: Two-stage least square regression

This table reports the second-stage regression of a two-stage least squares approach. The dependent variable is the bid premium (see the Appendix for the variable definitions). The first-stage probit is not reported. *Heckman's Lambda* is the inverse Mills ratio, obtained using the two-stage Heckman (1979) procedure described in Section 3.3.  $R^2$  and *F-Statistic* denote the r-square and the Fisher statistic for the regression, respectively. *P*-values are obtained using the bootstrap procedure described in Section 3.3 and reported in parentheses underneath the coefficient estimates.

| Dependent Variable   | Abnormal Return Premium |                  | Actual Offer Premium |                  | Four-Week Premium |                  |
|--|-------------------------|------------------|----------------------|------------------|-------------------|------------------|
|  | (1)                     | (2)              | (3)                  | (4)              | (5)               | (6)              |
| Intercept  | 0.195<br>(0.01)         | 0.576<br>(0.00)  | 0.396<br>(0.00)      | 1.016<br>(0.00)  | 0.324<br>(0.00)   | 0.405<br>(0.00)  |
| Premium <sub><i>t</i>-1</sub>                              | 0.291<br>(0.00)         | 0.195<br>(0.00)  | 0.252<br>(0.00)      | 0.182<br>(0.01)  | 0.164<br>(0.00)   | 0.127<br>(0.03)  |
| Premium <sub><i>t</i>-1</sub> x SCAR <sub><i>t</i>-1</sub> | 0.090<br>(0.05)         | 0.153<br>(0.00)  | 0.068<br>(0.04)      | 0.054<br>(0.09)  | 0.043<br>(0.08)   | 0.061<br>(0.02)  |
| Stock  |                         | -0.003<br>(0.93) |                      | -0.063<br>(0.20) |                   | 0.016<br>(0.50)  |
| Target Size  |                         | -0.042<br>(0.01) |                      | -0.053<br>(0.00) |                   | -0.018<br>(0.08) |
| Acquirer Tobin's <i>q</i>                                  |                         | 0.027<br>(0.15)  |                      | 0.035<br>(0.13)  |                   | 0.027<br>(0.09)  |
| Target Tobin's <i>q</i>                                    |                         | 0.024<br>(0.07)  |                      | 0.067<br>(0.00)  |                   | 0.027<br>(0.05)  |
| Toehold  |                         | -0.143<br>(0.12) |                      | 0.262<br>(0.10)  |                   | -0.003<br>(0.98) |
| Related Deal   |                         | -0.015<br>(0.64) |                      | -0.025<br>(0.59) |                   | -0.052<br>(0.19) |
| Acquirer GIM Index   |                         | -0.007<br>(0.25) |                      | -0.024<br>(0.04) |                   | -0.001<br>(0.72) |
| Acquirer Inst. Ownership                                   |                         | -0.001<br>(0.99) |                      | -0.185<br>(0.08) |                   | 0.048<br>(0.27)  |
| Acquirer Inst. Concentration                               |                         | -1.376<br>(0.00) |                      | -0.003<br>(0.98) |                   | -0.354<br>(0.29) |
| Heckman's Lambda   | 0.014<br>(0.56)         | -0.012<br>(0.72) | 0.081<br>(0.19)      | -0.032<br>(0.42) | -6E-5<br>(0.99)   | -0.023<br>(0.31) |
| Number of observations                                     | 290                     | 186              | 240                  | 166              | 263               | 161              |
| Adjusted- $R^2$  | 11.79%                  | 27.61%           | 10.30%               | 25.74%           | 5.82%             | 19.38%           |
| <i>F</i> -Statistic  | 12.74                   | 5.50             | 9.04                 | 4.42             | 5.33              | 2.97             |

Table 5  
Explaining the bid premium with market signals: CEOs with single sequence

The dependent variable is the bid premium. An observation is a sequence of two successive deals undertaken by the same CEO–firm within a 12-month time frame. The sample includes only unique CEOs. If a CEO has undertaken more than one sequence of two acquisitions within 12 months, we include only the first observation. For each premium definition, we provide a model without and with control variables. Variable definitions are in the Appendix.  $R^2$  and  $F$ -Statistic denote the r-square and the Fisher statistic for the regression, respectively.  $P$ -values are obtained using the bootstrap procedure described in Section 3.3 and reported in parentheses underneath the coefficient estimates.

| Variable   | Abnormal Return Premium |                  | Actual Offer Premium |                  | Four-Week Premium |                  |
|--|-------------------------|------------------|----------------------|------------------|-------------------|------------------|
|  | (1)                     | (2)              | (3)                  | (4)              | (5)               | (6)              |
| Intercept  | 0.224<br>(0.00)         | 0.528<br>(0.00)  | 0.519<br>(0.00)      | 0.736<br>(0.00)  | 0.362<br>(0.00)   | 0.402<br>(0.01)  |
| Premium <sub><i>t</i>-1</sub>                              | 0.326<br>(0.00)         | 0.210<br>(0.00)  | 0.293<br>(0.00)      | 0.258<br>(0.00)  | 0.134<br>(0.00)   | 0.132<br>(0.01)  |
| Premium <sub><i>t</i>-1</sub> x SCAR <sub><i>t</i>-1</sub> | 0.121<br>(0.00)         | 0.138<br>(0.00)  | 0.078<br>(0.00)      | 0.036<br>(0.10)  | 0.038<br>(0.03)   | 0.049<br>(0.04)  |
| Stock  |                         | 0.013<br>(0.65)  |                      | -0.107<br>(0.00) |                   | 0.021<br>(0.42)  |
| Target Size  |                         | -0.040<br>(0.00) |                      | -0.043<br>(0.00) |                   | -0.025<br>(0.06) |
| Acquirer Tobin's $q$                                       |                         | 0.022<br>(0.25)  |                      | 0.004<br>(0.81)  |                   | 0.033<br>(0.07)  |
| Target Tobin's $q$   |                         | 0.033<br>(0.03)  |                      | 0.113<br>(0.00)  |                   | 0.034<br>(0.03)  |
| Toehold  |                         | -0.120<br>(0.08) |                      | 0.239<br>(0.04)  |                   | 0.061<br>(0.54)  |
| Related Deal   |                         | 0.090<br>(0.01)  |                      | 0.079<br>(0.02)  |                   | 0.010<br>(0.72)  |
| Acquirer GIM Index   |                         | -0.007<br>(0.16) |                      | -0.015<br>(0.08) |                   | -0.004<br>(0.30) |
| Acquirer Inst. Ownership                                   |                         | -0.032<br>(0.24) |                      | -0.194<br>(0.01) |                   | -0.011<br>(0.75) |
| Acquirer Inst. Concentration                               |                         | -1.779<br>(0.00) |                      | -0.920<br>(0.02) |                   | -0.136<br>(0.59) |
| Number of observations                                     | 163                     | 112              | 132                  | 97               | 151               | 98               |
| Adjusted- $R^2$  | 16.17%                  | 30.40%           | 14.51%               | 45.89%           | 3.79%             | 16.38%           |
| $F$ -Statistic   | 15.43                   | 3.97             | 10.95                | 6.55             | 2.92              | 1.53             |

Table 6  
Explaining the bid premium with market signals: Alternative time frames

The dependent variable is the bid premium. An observation is a sequence of two successive deals undertaken by the same CEO–firm within 6-month or 24-month time frames. Variable definitions appear in the Appendix.  $R^2$  and  $F$ -Statistic denote the r-square and the Fisher statistic for the regression, respectively.  $P$ -values are obtained using the bootstrap procedure described in Section 3.3 and reported in parentheses underneath the coefficient estimates.

Panel A. Two successive deals within a 6-month time frame

| Variable   | Abnormal Return<br>Premium | Actual Offer<br>Premium | Four-Week<br>Premium |
|--|----------------------------|-------------------------|----------------------|
| Intercept  | 0.199<br>(0.00)            | 0.448<br>(0.00)         | 0.356<br>(0.00)      |
| Premium <sub><math>t-1</math></sub>                                    | 0.385<br>(0.00)            | 0.338<br>(0.00)         | 0.164<br>(0.00)      |
| Premium <sub><math>t-1</math></sub> x SCAR <sub><math>t-1</math></sub> | 0.079<br>(0.09)            | 0.046<br>(0.14)         | 0.064<br>(0.02)      |
| Number of observations   | 174                        | 150                     | 157                  |
| Adjusted- $R^2$  | 17.32%                     | 14.30%                  | 8.34%                |
| $F$ -Statistic   | 17.91                      | 12.26                   | 7.00                 |

Panel B. Two successive deals within a 24-month time frame

| Variable   | Abnormal Return<br>Premium | Actual Offer<br>Premium | Four-Week<br>Premium |
|--|----------------------------|-------------------------|----------------------|
| Intercept  | 0.229<br>(0.00)            | 0.505<br>(0.00)         | 0.358<br>(0.00)      |
| Premium <sub><math>t-1</math></sub>                                    | 0.273<br>(0.00)            | 0.261<br>(0.00)         | 0.061<br>(0.02)      |
| Premium <sub><math>t-1</math></sub> x SCAR <sub><math>t-1</math></sub> | 0.048<br>(0.09)            | 0.026<br>(0.21)         | 0.034<br>(0.07)      |
| Number of observations   | 468                        | 387                     | 420                  |
| Adjusted- $R^2$  | 7.80%                      | 7.31%                   | 1.76%                |
| $F$ -Statistic   | 19.69                      | 15.14                   | 3.73                 |

Table 7  
Explaining bid premium: Learning and CEO compensation

The dependent variable is the bid premium. An observation is a sequence of two successive deals undertaken by the same CEO–firm within a 12-month time frame. For each premium definition, we provide a model without and with control variables. Variable definitions are in the Appendix.  $R^2$  and  $F$ -Statistic denote the r-square and the Fisher statistic for the regression, respectively.  $P$ -values are obtained using the bootstrap procedure described in Section 3.3 and reported in parentheses underneath the coefficient estimates.

| Variable   | Abnormal Return Premium |                  | Actual Offer Premium |                  | Four-Week Premium |                  |
|--|-------------------------|------------------|----------------------|------------------|-------------------|------------------|
|  | (1)                     | (2)              | (3)                  | (4)              | (5)               | (6)              |
| Intercept  | 0.223<br>(0.00)         | 0.556<br>(0.00)  | 0.497<br>(0.00)      | 0.883<br>(0.00)  | 0.332<br>(0.00)   | 0.403<br>(0.02)  |
| Premium <sub><i>t</i>-1</sub>  | 0.286<br>(0.00)         | 0.230<br>(0.00)  | 0.249<br>(0.00)      | 0.209<br>(0.01)  | 0.178<br>(0.00)   | 0.182<br>(0.01)  |
| Premium <sub><i>t</i>-1</sub> x SCAR <sub><i>t</i>-1</sub>                 | 0.034<br>(0.38)         | 0.094<br>(0.08)  | 0.010<br>(0.62)      | 0.010<br>(0.63)  | 0.032<br>(0.16)   | -0.014<br>(0.56) |
| Premium <sub><i>t</i>-1</sub> x SCAR <sub><i>t</i>-1</sub> x CEO Incentive | 0.041<br>(0.15)         | 0.048<br>(0.18)  | 0.050<br>(0.00)      | 0.051<br>(0.01)  | 0.004<br>(0.66)   | 0.066<br>(0.00)  |
| Stock  |                         | 0.038<br>(0.27)  |                      | -0.048<br>(0.23) |                   | 0.009<br>(0.70)  |
| Target Size  |                         | -0.031<br>(0.02) |                      | -0.061<br>(0.00) |                   | -0.048<br>(0.00) |
| Acquirer Tobin's $q$   |                         | 0.018<br>(0.15)  |                      | 0.011<br>(0.36)  |                   | 0.019<br>(0.08)  |
| Target Tobin's $q$   |                         | 0.033<br>(0.07)  |                      | 0.083<br>(0.00)  |                   | 0.029<br>(0.05)  |
| Toehold  |                         | 0.067<br>(0.39)  |                      | 0.237<br>(0.11)  |                   | -0.097<br>(0.28) |
| Related Deal   |                         | -0.018<br>(0.53) |                      | -0.003<br>(0.95) |                   | 0.014<br>(0.58)  |
| Acquirer GIM Index   |                         | -0.001<br>(0.75) |                      | -0.016<br>(0.09) |                   | -0.006<br>(0.26) |
| Acquirer Inst. Ownership   |                         | 0.075<br>(0.12)  |                      | -0.131<br>(0.10) |                   | 0.016<br>(0.64)  |
| Acquirer Inst. Concentration   |                         | -0.464<br>(0.23) |                      | 0.227<br>(0.67)  |                   | -1.310<br>(0.03) |
| Number of observations   | 314                     | 194              | 259                  | 174              | 283               | 168              |
| Adjusted- $R^2$  | 10.94%                  | 27.85%           | 12.42%               | 29.43%           | 5.22%             | 18.83%           |
| $F$ -Statistic   | 12.69                   | 5.82             | 12.05                | 5.59             | 5.13              | 3.00             |