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Corporate serial acquisitions: An empirical test of the learning hypothesis

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Abstract

Recent empirical papers report a declining trend in the cumulative abnormal return (CAR) of acquirers during an M&A program. Does this necessarily imply that acquiring CEOs are infected by hubris and are not learning from previous mistakes? We first confirm the existence of this declining trend on average. However, we find a positive CAR trend for CEOs likely to be infected by hubris, which is significantly different from the negative trend found for CEOs who are more likely to be rational. We also explore the time between successive deals and find empirical evidence to suggest that many CEOs learn substantially during acquisition programs.

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Recent empirical papers report a declining trend in cumulative abnormal returns (CARs) of acquiring firms during merger and acquisition (M&A) programs. Fuller *et al.* (2002), analyzing 3,135 successful deals during the nineties in the US, report an average acquirer CAR of 2.74% for the first acquisition, declining to 0.52% for the fifth and successive acquisition. Similar results, some even more dramatic, are reported in Billett and Qian (2005), Croci (2005), Conn *et al.* (2005), (for UK M&As), Ismail (2006) and Ahern (2006). The question is no longer whether this phenomenon is real or robust. The empirical procedures in the above-cited papers are sound and we replicate similar results here. But how should this pattern be interpreted? Is the declining trend a sign of growing hubris with repetitive acquisitions, as is often alleged in these papers[1]? Or could it be consistent with rational CEO learning?

The question is important. The management literature argues that acquirers can benefit greatly from learning (Hayward, 2002; Harding and Rovit, 2004). Hayward (2002) even identifies the conditions allowing (organizational) learning: (i) deals not too close together nor too far apart in time, (ii) deals not too similar nor different in terms of businesses, and (iii) decision-makers with appropriate economic incentives. In the economic and finance literature also, there is a long tradition of considering learning as a key feature of decision making (see, *inter alia*, Grossman *et al.*, 1977, Zeira, 1987; Rob, 1991; Jovanovic and MacDonald, 1994; Bernardo and Chowdhry, 2002; Berk *et al.*, 2004). CEO decision makers who exhibit growing hubris contradict these ideas. It would also raise doubt about the efficacy of corporate governance mechanisms, which would seem unable to forestall value-destroying decisions and unable to select CEOs who act rationally in behalf of shareholders.

The direct impact of CEOs on the M&A decisions and their risk aversion are two stylized features examined in previous papers (e.g., Bertrand and Schoar (2003) and Cai and Vijh (forthcoming *Journal of Finance*)). Aktas *et al.* (2006) – ADR hereafter – derive a theoretical model of decision making for both rational and hubris-infected CEOs. In their formal analysis, the CEO has to value a potential acquisition before bidding. During this initial valuation stage, the CEO faces a tradeoff between over-evaluation, which could lead ex-post to disappointment and possible sanctions (such as dismissal), and under-valuation, which would make successful deal

[1] Some these papers bear enlightening titles. Just to mention a few: "Are overconfident managers born or made? Evidence of self-attribution bias from frequent acquirers" (Billet and Quian (2005), "Why must all good things come to an end? The performance of multiple acquirers" (Conn *et al.* (2005)), "Will multiple acquirers ever learn? The US evidence from single versus multiple acquirers" (Ismail (2006)).

completion unlikely. Financial markets are assumed (semi-strong) efficient, and their reactions to successive deal announcements are signals sent to the CEO, who uses them to update his beliefs about potential synergies with targets. Hubris is defined as a form of cognitive bias, leading to over-estimated expected synergies (over-optimism) or to under-estimated synergy risk (over-confidence).

From the valuation tradeoff combined with learning and/or hubris, ADR draw implications about CEO bidding behavior and about ex-post observable prices, the announcement period CAR, and the time between successive deals (TBD). The theory delivers a set of empirically testable implications for rational and hubris infected CEOs. It implies that a declining CAR trend is NOT sufficient to imply growing hubris during M&A programs. Indeed, a declining CAR can be explained by several alternative phenomena (e.g., a shrinking investment opportunity set or increasing competition among acquirers in M&A waves). However, the combination of predictions about the CAR and the TBD is distinctly different for rational and hubris-infected CEOs within the ADR theory.

In this paper, we subject the ADR theory to empirical test. Our aim is to describe the dominant traits of the US CEO decision makers during M&A programs and to test whether the empirical predictions developed in ADR are supported by the facts. We study a sample of 2,589 individual CEOs, spanning the 1992-2002 period. Among them, 1,235 have not made any acquisitions while 1,424 have made at least one. In the latter group, the average number of deals is 3.28, or 4,677 deals in total.

The key features of our empirical approach are: (i) as in Croci (2005), we focus on CEOs and not on firms because we believe that CEOs play a central role in M&A decisions. Especially when dealing with hubris and learning, it seems sensible to focus on specific individual decision makers; (ii) we adapt our econometric methods to the natural panel structure of the data (tracking successive deals done by a given CEO); (iii) we investigate the determinants of the TBD, which is, to the best of our knowledge, the first empirical evidence about this attribute of M&A programs; (iv) using a two-step procedure similar to Leschinskii and Zollo (2004) and Gaspar *et al.* (2005), we explicitly control for potential endogenous sample selection biases.

Our first step is to corroborate the previously reported declining CAR pattern from deal to deal. Then, using the ADR model's predictions, we provide a set of new results. Our univariate

analyses show that (i) during M&A programs, CEOs, firms and deal profiles change (this is not necessarily a surprise but it verifies that repetitive acquirers are not the same as one time acquirers); (ii) although the CAR declines from deal to deal on average, it increases for hubris-infected CEOs;[2] (iii) as predicted by the ADR model, TBD decreases from deal to deal but again there are differences between rational and hubris-infected CEOs.

Multivariate analyses deliver two principal results:

- (i) controlling for panel data and endogenous sample selection, while CARs decline on average during M&A programs, for hubris-infected CEOs, they increase and the difference is statistically significant. This result is robust to the inclusion of many control variables and to alternate hubris proxies;
- (ii) TBD decreases from deal to deal both on average and for hubris-infected CEOs, though it is almost flat for the latter. This result is robust to the inclusion of many control variables. We also uncover some interesting relations between CEO remuneration and the evolution of TBD.

The results generally support the ADR theory and its underlying learning hypothesis. In particular, the combination of a declining average CAR, an increasing CAR for hubris-infected CEOs, and a declining average TBD, are direct predictions of the theory. However, in conflict with the theory's predictions, we do not find an increasing TBD for hubris-infected CEOs. But the nearly flat TBD trend for these CEOs and its statistically significant difference from the TBD trend for rational CEOs points in the right direction (especially considering the inherently noisy nature of hubris proxies and the errors-in-variables problem pointed out in ADR). Finally, we find an increasing CAR from deal to deal for public targets. This is incompatible with a shrinking investment opportunity set. Overall, the results suggest that average CEO behavior is characterized by learning and that the effects of learning seem to be present even when a CEO is initially infected by hubris.

The first section of the paper briefly reviews various explanations of the CAR pattern from deal to deal in M&A programs including the testable implications of the ADR theory. Section II describes our sample, variables and empirical methods. Section III is devoted to a preliminary set of univariate tests while Section IV provides multivariate tests. The final section summarizes and concludes.

[2] Section II explains the hubris measure.

I. M&A Programs and Value Creation

A. CAR Patterns during M&A Programs

Schipper and Thompson (1983) are among the first to emphasize the repetitive nature of acquisitions. They show that acquisition program announcements are value creating.[3] This suggests that market reactions to subsequent deal announcements do not represent the full value created, but are merely revisions of previous investor anticipations. Under this acquisition program anticipation hypothesis, one should observe a significant market reaction around either an acquisition program announcement or a surprise first deal announcement (i.e., a deal announcement that is not preceded by a program announcement.) However, for subsequent announcements, only the unanticipated information revealed at that time should impact stock market prices. This would imply a CAR profile characterized by a large initial spike, followed by more modest successive CARs randomly distributed around zero (assuming that financial markets do not make systematically biased mistakes.) Hence, the acquisition program anticipation hypothesis does not predict a declining CAR trend in successive deals.

Other contributions focus on CEO hubris as a key psychological factor in acquisitions. Referencing Roll (1986), Rau and Vermaelen (1998), Malmendier and Tate (2006), Moeller *et al*. (2005), among others, interpret the empirical evidence to indicate hubris; the evidence includes long term post acquisition under-performance, CEO option exercise patterns, and value-destroying deals. Fuller *et al* (2002), Billett and Qian (2005), Conn *et al*. (2005), Croci (2005), Ismail (2006) and Ahern (2006) all find a declining trend in the CAR during M&A programs. This clear empirical regularity is also interpreted as a sign of hubris (the implicit assumption being that hubris is growing from deal to deal), except by Croci (2005) and Ahern (2006). Using performance persistence measures borrowed from the performance attribution literature, Croci (2005) shows that neither performance persistence (good deals following good deals) nor performance reversals (bad deals following good deals) are statistically significant. He concludes that CEOs seem neither to possess superior target picking skills nor to be systematically overconfident. Ahern (2006) focuses on information anticipation and organizational learning. He argues that CARs incorporate investor anticipations about learning by acquirers during M&A programs, so information anticipation must be controlled to obtain valid empirical tests (in the

[3] Conflicting evidence however exist in the literature (see, e.g., Asquith *et al.*, 1983; Ahern, 2006).

presence of learning.) The author also presents indirect evidence of learning at the organizational level.

Klasa and Stegemoller (forthcoming *Financial Management*) present a new argument. They study the relation between growth opportunities and M&A sequences made by individual bidders. The authors posit that M&A sequences begin in response to an expansion of the investment opportunity set and end when it is finally exhausted. The CAR trend observed ex-post would therefore reflect the declining investment opportunity set rather than hubris-infected CEOs. While the authors provide empirical support for their argument, proxies used to measure the investment opportunity set are subject to some question.

The time between successive deals (TBD) has not been investigated previously, perhaps owing to a lack of any theoretical predictions about what TBD pattern should be observed, if any. Indeed, neither the acquisition program anticipation hypothesis, nor the hubris hypothesis nor the time-varying investment opportunity set hypothesis, predict a TBD pattern during M&A programs.

So, a declining CAR in successive deals is compatible with different arguments, growing hubris and a shrinking investment opportunity, to mention only two. More specific theoretical predictions are needed to test empirically for the presence (or absence) of learning.

B. The ADR Model

In Aktas *et al.* (2006) (ADR) an under-diversified risk-averse CEO competes in market for acquisitions. The CEO first values potential synergies with a possible target and then engages attempts to buy it either through competitive bidding or bargaining.

The CEO's reservation valuation. Potential synergies with the target at the t^{th} deal of the acquisition program are denoted s_t. They are uncertain and follow a Gaussian distribution $\tilde{s}_t \propto N(\mu_s, \sigma_s^2)$. Since μ_s and σ_s^2 are assumed to be constant over time, the ADR model's implications are not driven by variations in the investment opportunity set. Rational CEOs know μ_s and hubris-infected CEOs over-estimate synergies at the beginning of the M&A program ($\hat{\mu}_{s,1} > \mu_s$, where ^ refers to CEO's perceptions and *1* to the first deal within the M&A

sequence[4]). When valuating the potential synergies, the CEO maximizes his own utility function. He faces a conundrum: if his valuation and the offering price are too low the takeover attempt will probably fail; but if the valuation is too high and the takeover succeeds, the CEO risks some form of penalty because of disappointing synergies relative to the price paid. Let B_t denote the CEO's risk-adjusted bonus in case of deal completion and successful implementation (the CEO stays in place) and let L_t denote the risk-adjusted penalty imposed on the CEO when synergies are disappointing. Learning enters the model as a Bayesian inference process. Market reactions to past deal announcements are signals (denoted η_t) received by the CEO, helping him to better assess potential synergies with targets. Signals are assumed to follow a Gaussian distribution $\tilde{\eta}_t \propto N(\mu_s, \sigma_\eta^2)$. Note that signals are centered on true expected synergies. This is tantamount to an assumption that financial markets are efficient; hence, none of the ADR model's implications are due to misvaluation by investors. The CEO has some perception of the risk associated with synergies ($\hat{\sigma}_t^2$) and, from deal to deal, updates this perception using market signals. Using classical conjugate prior results, $\hat{\sigma}_t^2$ can be written as:

$$\frac{1}{\hat{\sigma}_{s,t}^2} = \frac{1}{\hat{\sigma}_{s,0}^2} + (t-1)\frac{1}{\sigma_\eta^2} \tag{1}$$

In words, $\hat{\sigma}_t^2$ declines with the number of previous deals completed by the individual CEO; since each deal generates another market signal. Since the CEO is risk averse, the risk-adjusted expected bonus B_t is a negative function of $\hat{\sigma}_t^2$ ($\partial B_t / \partial \hat{\sigma}_t^2 < 0$) learning increases the risk-adjusted expected bonus B_t (everything else kept constant).[5]

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[4] As pointed out in ADR, a CEO's initial perception may be biased in two respects: over-optimism about expected synergies, (the case that we deal with here), or over-confidence (under-assessment of the risks of synergies.) We limit the analysis here to over-optimism since either cognitive bias leads to the same empirical predictions.

[5] In ADR, the authors assume a linear wage contract in the form of $B + bMV_T\tilde{s}_t$ where *B* is a cash bonus, *b* is a variable component, MV_T is the market value of the target, $\tilde{s}_t$ denotes the random synergies and γ is the usual risk aversion coefficient. Using a Taylor series approximation, the authors show that the expected risk adjusted bonus takes the form $(B + bMV_T\mu_s - \gamma/2\,(B + bMV_T\mu_s)^2 - \gamma/2\, b^2 MV_T^2 \hat{\sigma}_{s,t}^2)$, which is clearly a negative function of $\hat{\sigma}_t^2$.

The CEO's reservation value (the maximum price he is willing to pay) is obtained by expected utility maximization. Under a set of assumptions including uniform distributions for the probability of deal completion and the probability of penalty for over-payment), the reservation value, *v**, is determined by the following equation

$$\frac{v^* - V^-}{V^+ - V^-} = \frac{1}{2} \times \frac{B_t}{B_t + L}, \tag{2}$$

where, V^- corresponds to the target's current market value, and V^+ corresponds to a valuation level for which the takeover attempt will succeed with certainty but the CEO will be fired because of over-payment. In words, the CEO's reservation value increases with the risk-adjusted expected bonus, ($\partial v^* / \partial B_t > 0$).

Bids, prices, CAR and TBD. M&A operations have varied forms. Direct takeovers receive the most notoriety, but they represent only a fraction of all acquisitions (see Andrade *et al.*, 2001)); for them ascending auctions are typically used to model the competition among acquirers. Private acquisitions orchestrated by financial intermediaries (a significant percentage of all acquisitions according to Boone and Mulherin (forthcoming, *Journal of Finance*)) seem closer to first-price sealed bid auctions (Hansen, 2001). Direct bargaining between acquirer and target is also frequent. For each of the above three forms, given (a) CEO risk aversion, (b) positive correlation of potential synergies across acquirers, (c) asymmetry across acquirers due to diverse prior experience, and (d) independent private valuations, the equilibrium bidding and pricing functions (respectively $\beta(.)$ and $p(.)$) are shown to be strictly increasing in the CEO's reservation value v^*:

$$\frac{\partial \beta(v^*)}{\partial v^*} > 0 \text{ and } \frac{\partial p(\beta(v^*))}{\partial v^*} > 0 \tag{3}$$

This implies that a higher acquisition price for a given level of synergies will result in a lower fraction of synergies being accrued by the acquirer:

$$\frac{\partial CAR\left(p(\beta(v^*))\right)}{\partial v^*} = \frac{\partial CAR\left(p(\beta(v^*))\right)}{\partial p(\beta(v^*))} \times \frac{\partial p(\beta(v^*))}{\partial \beta(v^*)} \times \frac{\partial \beta(v^*)}{\partial v^*} < 0 \tag{4}$$

On the other hand, a higher acquisition price brings a higher probability of success and, for a given number of transaction attempts by period, a lower TBD:

$$\frac{\partial TBD\left(p(\beta(v^*))\right)}{\partial v^*} = \frac{\partial TBD\left(p(\beta(v^*))\right)}{\partial p(\beta(v^*))} \times \frac{\partial p(\beta(v^*))}{\partial \beta(v^*)} \times \frac{\partial \beta(v^*)}{\partial v^*} < 0 \qquad (5)$$

Empirical implications. Equations (4) and (5) allow ADR to derive a rich set of empirical predictions about the implications of learning during M&A programs. These are summarized in Figure 1. Panel A presents the results for rational CEOs. As learning progresses, rational CEOs improve their ability to forecast potential synergies. Consequently, they bid more aggressively with each successive deal, increasing the offering price. This increases the probability of doing deals (so TBD decreases) and increases the fraction of value creation conceded to target shareholders (so the acquirer's CAR also decreases)[6]. These predictions depend on CEO risk aversion: more confidence about future synergies brings higher valuations.

Since CEOs are potentially infected by hubris (see Malmendier and Tate (2005) and Ben-David *et al.* (2006)), it is also important to analyze potential implications of learning for hubris-infected CEOs (see Figure 1, Panels B and C). Initial bids should be either slightly value creating (the CEO over-bids but not enough to destroy value) or value destroying (the over-bidding is severe enough that the acquisition premium exceeds potential synergies). However, market reactions to past deal announcements provide a lesson. CEOs infected with hubris learn and progressively reduce value destruction (the CAR trend is positive), by reducing their aggressiveness in the bidding process. This should also lead to an increase in TBD from deal to deal. The testable prediction of increasing CAR and TBD for hubris-infected CEOs is specific to the learning process underlying the ADR theory.

Empirical tests of ADR predictions are exposed to significant pitfalls. One involves endogenous sample selection. Completed deals involve only auction winners, who may either be more talented or be more hubris infected; this is exacerbated by a further *survival* bias since really badly-infected CEOs will probably be fired by shareholders. A second pitfall involves errors-in-variables. CEOs who create value at the beginning of an M&A program, are a mix of both rational (Figure 1 – Panel A) and hubris-infected (Figure 1 – Panel C). But the empirical

[6] This essentially implies that each successive deal is not completely anticipated.

predictions are conflicting: decreasing trends of both CAR and TBD for rational CEOs while increasing trends for hubris-infected CEOs. The mixture of rational and hubris-infected CEOs is thus likely to weaken the power of empirical tests. A partial resolution is to use some sort of instrumental variable (or proxy) allowing hubris-infected CEO identification, but this inevitably has its own errors-in-variable problem. The empirical methods we adopt attempt to deal systematically with these issues.

II. Data and Empirical Methods

A. Sample Constitution

To understand CEO behavior during M&A programs, we need to follow their successive decisions over an extended time period. Our sample of CEOs is extracted from Compustat ExecuComp. This database provides information about CEO compensation essential for testing predictions of the ADR model. The ExecuComp database starts in 1992. In order to observe the full history of each CEO's successive decisions, we therefore study only CEOs hired in 1992 and later. The data base includes 2,589 CEOs making decisions between 1992 and 2002. These 2,589 persons have been CEOs of 1,740 different firms. So some (70) have been CEOs of more than one firm. Our analysis focuses on *'CEO-Firm'* couples (an individual CEO at a particular firm), referenced hereafter under the generic term of CEO. Table 1 – Panel A presents the sample evolution through time. The sample increases through time and is sizeable by the mid-nineties.

To identify M&A operations undertaken by these CEOs, we rely on the Thomson SDC database. Since we want to control for an acquisition program effect (more on this in Section II.B), we collect deals beginning in 1990. Our deal selection criteria are as follows: US listed acquirers, all targets (US and non-US, listed and non-listed), completed deals and percentage of shares held before the deal less than 50%. To ease the comparison of our results with previously published ones, we present two samples: the *'Full Sample'*, which includes all deals of at least one million dollars, and the *'Big Sample'*, which is restricted to deals larger than one hundred million dollars. The *'Full Sample'* essentially mimics that used by Moeller *et al.* (2005) and it includes 28,662 deals. The *'Big Sample'* includes 6,108 deals and is closer to Fuller *et al.* (2002) or Billett and Qian (2005). Table 1 – Panel B and C present their evolutions through time. The end of the nineties merger wave is clearly apparent in both samples (in the number of deals and in their aggregate value).

An individual CEO's M&A decision history is built by matching the CEO sample with either the M&A *'Full Sample'* or *'Big Sample'*, taking into account the CEO's period of activity reported by Compustat ExecuComp. Table 2 – Panel A describes the matched samples. For the *'Full Sample'* of M&As, 4,677 deals are matched to 1,424 CEOs. The average number of deals per CEO is 3.28. For 1,235 CEOs, no deal has been identified. For the *'Big Sample'*, 2,021 are matched, 872 CEOs have done at least one deal (with an average of 2.32 deals per CEO) and 1,787 CEOs are classified as having done no deal. Table 2 – Panel B presents the number of CEOs having done at least a given number of deals. The results confirm that repetitive acquisitions are frequent (see Schipper and Thompson, 1983). Our M&A decision history reconstruction possibly misses some deals since the Thomson SDC coverage is extensive but perhaps not exhaustive.

We complement information provided by Compustat ExecuComp and Thomson SDC using the CRSP and Compustat databases. Data availability limits our final sample sizes, depending on the control variables used in various tests. We therefore systematically report the exact number of observations in each computation. We also have used data from the Securities and Exchange Commission (SEC) Ownership Reporting System to track acquirers that undertook insider trading.

B. Variable Definitions

Our main dependent variables are the cumulative abnormal return (CAR)[7] observed around the acquisition announcement date and the time between successive deals (TBD).[8] To compute the CAR, daily abnormal returns are computed as in Fuller *et al.* (2002) and Moeller *et al.* (2004; 2005) using the Beta-one model, which subtracts the daily market portfolio return from the daily return of each company. We use the daily equal weighted CRSP index as a proxy for the market portfolio. The standard market model (or any model that requires coefficient estimation) could be problematic due to repetitive acquisitions and concomitant overlapping observations. The event-window goes from day minus five to day plus five relative to the announcement date (the Thomson SDC announcement dates are known to be somewhat imprecise, which suggests that the event window should not be too narrow). To form a cumulative average abnormal return, CAAR, we use equal weighting. It has been feasible to compute the CAR for 25,845 out of the 28,662

[7] ADR model also delivers predictions about bids and prices, so it would be interesting to investigate their determinants too. But data availability constraints would drastically reduce the sample sizes.
[8] For the first deal, TBD is the time between the CEO hiring date and the first deal announcement date.

deals in the *Full Sample*. The average CAR is 1.6% (t-stat of 18.6) and its median is 0.5%. These results are compatible with recent papers focusing on exhaustive M&A samples (see Moeller *et al.*, 2004).

For multivariate analyses, the main independent variable is the deal sequence number (SEQ), whose coefficient measures the time slope of the CAR or TBD during the M&A program.

The existing literature suggests the inclusion of three categories of control variables. A brief summary follows and a detailed description can be found in the Appendix.

- CEO specific: the hiring and departure dates determine the activity period. Compustat ExecuComp provides CEO remuneration variables (annual base salary, the variable component of salary relative to the base salary, share holdings). These are important as controls because CEO remuneration is known to influence acquisition decisions (Hubbard and Palia, 1995; Datta *et al.*, 2001; Grinstein and Hribar, 2004). Age and gender might be related to CEO risk aversion and but are frankly included out of sheer curiosity.
- Deal specific: the announcement date (from Thomson SDC), the deal size (see among many others Moeller *et al.* (2005)), the percentage acquired and the toehold (Schwert, 2000; Betton and Eckbo, 2000), the payment method (e.g., Travlos, 1987; Huang and Walkling, 1987; Hansen, 1987; Martin, 1996; Faccio and Masulis, 2005), the attitude (hostile versus friendly deals, as reported by Thomson SDC) and the number of bidders (Jensen and Ruback, 1983), the strategic fit between the bidder and the target (Servaes, 1996), the target's private/public status (Fuller *et al.*, 2002) and a proxy for the target's size (based on the percentage acquired and the deal size).[9]
- Firm specific: following previous research, these are bidder characteristics, including the bidder's past performance (Rau and Vermaelen, 1998), market anticipation effects (Palepu, 1986), the acquisition program effect (see a.o. Schipper and Thompson, 1983; Malatesta and Thompson, 1985), several variables to control for industry determinants, including the sector concentration, the number and value of transactions in the industry (see, e.g., Mitchell and Mulherin, 1996; Andrade and Stafford, 2004; Harford, 2005), the extent of the acquirer's diversification (using information provided by the Compustat Segment database), the acquirer's size (Moeller *et al.*, 2004) and several acquirer financial ratios (cash-flow/total assets, leverage,

[9] Since this proxy is based on the deal transaction price, it includes the premium paid by the bidder. Consequently, this control variable has been excluded from the set of CAR determinants, being clearly endogenous with respect to the market reaction around the deal announcement.

free cash-flow, growth of assets, growth of sales, liquidity, market to book, price-earning, return on equity and Tobin's q).

Since most targets are not listed, target controls are rather limited.

C. Methods

Econometric details will be described in Section III (univariate analyses) and Section IV (multivariate analyses). However, it is useful at this point to explain some generic choices underlying the empirical work.

C.1. Timing

Determinants of CEO behavior (base salary, variable component of the salary,…) are updated to their values at the end of the year before each acquisition; their evolution could be due (at least partially) to the succession of deals (Datta *et al.*, 2001; Rosen, 2004). Firm specific financial ratios and industry determinants are all calculated at the end of the year before the acquisition announcement (to avoid any feedback effects.)

C.2. Industry Classification

Instead of using SIC industry codes, which are subject to considerable criticism (see Kahle and Walkling,1996), we employ the 48 Fama-French classifications, exploiting the SIC to Industry Codes conversion table provided on Ken French' Web site[10] and historical SIC codes provided in the CRSP Database. This brings some balance among the number of industries, the number of firms within each industry and the homogeneity of intra-industry economic activity. These are important concerns when controlling for industry related determinants of market reactions to M&A announcements.

C.3. Hubris Proxy

Variable Definition. Finding a robust proxy for hubris is a real challenge. Because our empirical investigation is based on the ADR model, a good proxy should be close to the definition of hubris adopted in that model, which is a cognitive bias, leading either to over-optimism or over-confidence. The most direct consequence is over-bidding, leading in extreme cases to value

[10] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

destruction for the bidder shareholders at deal announcement. Our hubris proxy is based on this implication. Previous research, however (see Fuller *et al.* (2002) has found that a major determinant of the acquirer's CAR is the target's status, public versus private. Consequently the CARs of firms acquiring public targets cannot be directly compared to the CARs of firms acquiring private targets. The hubris proxy must control for this effect. So, our proxy, called the hubris index hereafter, is obtained using the following procedure:

- for each CEO, the CAR is computed at the announcement of their first deal;
- CEOs are split into two sub-samples, depending on the status of the target, public versus private, in their first acquisition; N_{pub} and N_{priv} are the numbers of CEOs in the public target sub-sample and the private target sub-sample, respectively;
- for each sub-sample, CEOs are ranked in decreasing order by the first deal CAR (r_i denotes the rank of the *ith* CEO);
- the hubris proxy, h_i, is then the CEO rank divided by the total number of CEOs in the sub-sample; i.e., $h_i = r_i / N_{pub}$ or $h_i = r_i / N_{priv}$.

The higher h_i, the lower the value of the CEO's first deal, hence the more likely the CEO is infected by hubris. While indirect and noisy, this proxy has several advantages. It is directly motivated by the ADR model. Since it is based on ranks, it is robust to outliers. Being computed by sub-samples of target status, it controls for that important determinant of acquirers' CAR.

Let us also note that:

- When the *'Full Sample'* is split between rational and hubris-infected CEOs (mainly for univariate analyses), we define a dummy variable taking the value 1.0 if h_i is above 0.75. The 0.75 threshold is chosen to assure that CEOs classified as hubris-infected actually destroyed value in their first deal (they experienced a negative CAR).
- Since the first deal CAR is used to determine h_i (or its dummy version), that CAR is excluded from other calculations. For example, trends in CAR and TBD start from the second deal (see Section III).

Empirical Validation. The hubris index plays a key role in testing the ADR model's implications and its underlying learning hypothesis. In an attempt to investigate whether this proxy is effectively correlated with CEO over-confidence and/or over-optimism, we have analyzed their insider trading activities. (Doukas and Petmezas (forthcoming *European Financial Management*) follow a comparable strategy using UK data.)

The Securities and Exchange Commission (SEC) Ownership Reporting System (ORS) contains corporate insider purchases and sales. On SEC Form 4, the ORS system includes security transactions by persons with beneficial ownership, primarily officers, directors and principal stockholders of a corporation. Following Lakonishok and Lee (2001), the following records were discarded: duplicated, amended, with no price information, with a recorded date preceding the transaction date, with a recorded date 31 days (or more) after the due date. We then identified acquirers that undertook insider trades during the three months preceding the announcement date of the first deal in an M&A program. The ORS database does not identify the insider trading but only the firm within which he is working. However the ORS database provides a classification: top executives, officers and directors. Out of our 1424 CEO-firms that made at least one acquisition during the period 1992-2002 (our full-sample), we have been able to identify 465 firms from with insiders who traded during the three months preceding the first deal announcement.

The results are as follows. For firms managed by CEOs classified as rational by the dummy variable version of our hubris index, the average net number of trades (buys minus sells) by insiders in the 3-month preceding the first deal announcement is -1.5 (or -$9,266,596 in sale proceeds on average.) For firms managed by CEOs classified as hubris-infected, the average net number of trades is -1.12 (-$2,873,690 in average sale proceeds.) For top executives only, the corresponding numbers are -0.29 by insiders of firms managed by rational CEOs (-$5,990,265) and -0.20 by insiders of firms managed by hubris-infected CEOs (-$1,453,174.)

Probably for diversification reasons, insiders are on average net sellers (see Lakonishok and Lee, 2001; Jenter, 2005). The ratio of rational CEOs' net trades to hubris-infected CEOs' net trades is 1.34 (-1.5/-1.12). In sales proceeds, the ratio is 3.32 (-$9,266,596/-$2,873.690). Insiders of firms managed by hubris-infected CEOs sell considerably less than their counterparts from firms managed by rational CEOs. Limiting attention to top executives activities only, the results are even stronger; the number of trades ratio is 1.46 (-0.29/-0.20) and the sales proceeds ratio is 4.12 (-5,990,265/-1,453,174). Hence, the hubris index seems to capture a real difference in perceived future prospects by insiders and the effect is more pronounced for insiders close to the CEO. Although hubris-infected CEOs by construction (of the index) destroy value at the first acquisition, insiders of their firms are more bullish.

Finally, we have verified that the hubris index does not have a systematic time trend during the 1992-2002 sample period.

C.4. Financial Ratios, Outliers and Statistical Tests

Financial ratios frequently exhibit large outliers (especially when the book value of equities is the denominator). Moreover, controlling for industry is often essential (e.g., for debt and leverage ratios – see MacKay and Phillips (2005)). To mitigate these potential difficulties, we discard any ratio whose denominator is a negative book value of equities and any ratio more than two standard deviations from the mean. In the multivariate analyses, we use industry median adjusted values.

All reported p-values are from a bootstrap procedure. We use a percentile-t approach, based on case by case resampling (Efron and Tibshirani, 1993), which is known to converge fast (Horowitz, 2002) and should perform well in small sub-samples.

C.5. The Acquisition Program Effect

Schipper and Thomson (1983) found that initial announcements of acquisition programs generate higher CARs then successive deal announcements; hence, we control for an acquisition program effect by including a dummy variable taking the value 1.0 if no deal has been announced by the firm in the two previous years.

III. Univariate Analyses

Our univariate analyses are presented in two tables. Table 3 focuses on the evolution of bidder (CEO and firm) and deal characteristics through M&A programs. Table 4 is dedicated to the CAR and TBD.[11] The univariate analysis extends through as many as seven acquisitions. This provides conformity with the later multivariate analyses (Section IV). As shown in Table 2, sample sizes become quite small after seven acquisitions and are insufficient for most multivariate tests. When interpreting univariate results, one should be mindful of the cross-sectional and the time series dimensions of the observations. For example, a negative trend in a

[11]To miminize the impact of outliers, Table 4 reports median values of CAR and TBD from deal to deal; Though it turns out that sample means have similar patterns (not reported.)

given ratio from deal to deal might be due to a general trend characterizing all CEOs or to a difference between CEOs doing few and many deals (or to both). The issue is resolved with the panel data analyses in Section IV.

To summarize the key results succinctly, we report the slope coefficient of each variable calculated in a pooled regression of the variable on the deal sequence number (SEQ). This slope coefficients measures the average linear trend through a succession of deals.

A. Bidder and Deal Characteristics from Deal to Deal

Table 3 – Panel A shows that CEO base salary increases significantly from deal to deal (a result also reported by Datta *et al.* (2001) and Rosen (2004)). This is, perhaps, simply the usual relation between CEO salary and firm size but it might also reveal that CEOs who survive to consummate more deals have done more successful deals and are rewarded. There is no significant increase in the CEOs variable compensation components (Interest and Holding). But since these are scaled either by total compensation or by company size there could still be a significant increase in the dollar value of variable remuneration. Industry concentration measures do not display a systematic trend. The number and value of deals done in the bidder's industry increase. This might be due to the late-1990s merger wave. Later deals, (higher SEQs), are more likely to have taken place later in the sample. The acquirer segment concentrations decrease and the number of segments increases, which clearly indicates that repetitive acquirers tend to diversify their activities. The increase in total assets is intuitively plausible. The asset and sales based growth rates indicate that size increases at an increasing rate but the effect is only marginally significant for sales. Understandably, acquirer liquidity decreases; evidently, purchasing targets uses up some current assets such as cash.

Table 3, Panel B describes the evolution of deal features. The percentage acquired increases significantly (from 89% to more than 95%) and so does the deal size, almost doubling on average. This is consistent with learning: CEOs could begin with smaller deals to learn the basics and then, when feeling more knowledgeable, they might risk bigger acquisitions (a practice stressed in the management literature (Harding and Rovit, 2004). The number of rivals significantly decreases: CEOs seems to be more and more able to deter competition (or else bigger deals attract fewer competitors); the effect is statistically significant but very small.

B. Acquirer CAR from Deal to Deal

The four left-most columns of Table 4 report the behavior of acquirer's CARs. Panel A gives results for the *'Full Sample'*. The CAR slope is negative and (marginally) significant, as reported in previous papers cited earlier. The *'Big Sample'* results, presented in Panel B, show a similar pattern, though the negative slope appears to be more significant, particularly taking into account the very small number of observations at the end of the deal sequence.

Are the CAR slopes different between rational and hubris-infected CEOs? Panel C of Table 4 explores this issue. For rational CEOs, the slope is negative and clearly significant. For hubris-infected CEOs, the slope is positive but not significantly different from zero. Recall that the ADR model predicts a negative slope for rational CEOs and positive slope for hubris-infected CEOs. Given the noisy hubris proxy, this result is somewhat supportive. Remember too that the first deal in the sequence is not included in this comparison. Is the difference of slopes significant? Is it robust to the inclusion of control variables and potential sample selection biases? The multivariate analyses in Section IV will offer an answer these questions.

C. TBD, the time between deals

The right-most columns of Table 4 present univariate results about TBD, which is clearly and strongly decreasing across deals. In Panel A, for the *'Full Sample'*, the median TBD between two deals goes from 426 days (between the CEO hiring date and his first deal) to 78 (between the 6th and 7th deals). In other words, near the end of an acquisition program, CEOs are doing deals roughly five times faster than at the beginning of the program. The negative slope is highly significant. The same result is confirmed in Panel B for the *'Big Sample'*,. Panel C focuses on rational CEOs and hubris-infected CEOs. The slope coefficient seems to be marginally less negative (by a factor of 10%) for the latter. The ADR model predicts a negative slope for rational CEOs and positive slope for hubris-infected CEOs. Taking into account the noisy nature of the hubris proxy, two conclusions seem justified:

- the TBD decrease for rational CEOs supports directly the learning hypothesis;
- the difference of slopes between rational CEOs and hubris-infected CEOs may or may not provide indirect support for the learning hypothesis, depending on its statistical significance. We test this further in Section IV.

D. Listed Target CARs

Listed targets are included in the data sample, so their CARs can be tracked from deal to deal. However, during a succession of acquisitions, a given acquirer typically mixes private and public targets, so there are gaps in the observable deal sequence targets. Keeping this limitation in mind, target CARs do not decline (middle columns of Table 4, Panels A and B). This offers little support to the idea that the acquirers' decreasing CAR is driven by a shrinking investment opportunity set.

From the results thus far, it appears that the *'Full Sample'* and the *'Big Sample'* are comparable. Consequently, for parsimony we present henceforth only results for the *'Full Sample'*, which has the advantage of larger sample sizes. Also, since initially doing small deals may be a way to learn, excluding them might results in the loss of pertinent information.

IV. Multivariate Analyses

This section analyses multiple determinants of the CAR and the TBD, emphasizing the role of the deal sequence number.

A. The CAR from Deal to Deal

A.1. Econometric Methods

A multivariate explanation of the CAR raises several econometric challenges. CARs are quite noisy (the typical R^2 of CAR regressions range from less than 1% to 6 or 7% (see, e.g., Moeller *et al.*, 2005). One must also consider the panel structure of the data and the potential endogenous sample selection biases pointed out in Section I.B. Panels A to C of Table 5 progressively tackle these problems.

Panel A of Table 5 presents a simple regression of the CAR on the deal sequence number; Panel B, after having conducted a Hausman specification test (the results of which are reported at the end of the Panel), presents corresponding results using a fixed panel data estimator; Panel C controls for both panel data and for the potential sample selection biases using a two-step

instrumental variable approach suggested in Wooldridge (2001).[12] In this case, we first use a Probit to construct an instrument for the probability of being included in the sample. The Probit model is used only to control for endogenous sample selection, so it's specification is not interesting in itself. The objective is to construct an instrument that is highly correlated with the probability of being included in the sample.[13] The Probit model is re-estimated from deal to deal. The probability of inclusion is then used to compute the Heckman lambda, which is included in the CAR regression. The CAR regression is calculated after first differencing in order to obtain the fixed effects estimator.

A.2. Results

The Panel A results conflict with the previously-reported univariate CAR results (see Table 4); in that the deal sequence number coefficient is insignificantly different from zero. This shows that the inclusion of control variables strongly affects the univariate evidence. This is confirmed in Panel B, using the fixed effects panel data estimator and in Panel C, using the Heckman two step estimator to control for potential endogenous sample selection. Unreported results shows that the inclusion of any one of the following control variables is sufficient to remove the statistical significance of the CAR trend: *Acquirer Market Value*, *Acquirer Industry Adjusted Tobin's q*, *Acquirer Industry Adjusted Free Cash-Flow*, *Acquirer Industry Adjusted Leverage*, *Acquirer Industry Adjusted Price Earning*, *Acquirer Industry Adjusted ROE*, *Acquirer Long Term Past CAR*, *Acquirer Segment Concentration* and the *Acquisition Program Dummy*. The last variable is particularly worthy of noting; taking account of an acquisition program is sufficient to remove a negative CAR trend. The clear message sent by Panels A, B and C is that the CAR's negative trend from deal to deal, when estimated with all CEOs jointly, is a byproduct of the changing sample of CEOs, firms and deals characteristics in successive acquisitions.

Some comments about several of the control variables:

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[12]We use the approach described in Woolridge's Section 17.7.3, which deals with endogenous attrition.

[13]Variables included in the Probit are *Gender*, *Salary*, *Interest*, *Acquirer Market Value*, *Number of deals already done by the firm*, *Number of segments*, *Industry Sales Based HHI*, *Industry Value of Deals (year-1)*, *Leverage*, *Tobin's q*, *Industry Total Assets*, *Industry Cash Flow*, *Industry Sales Based Growth Rate*, *Industry Leverage*, *Industry Market to Book*, *Industry Tobin's q*. Some of these variables are clearly correlated (e.g, *Industry Tobin'q* and *Industry Market to Book*) but their simultaneous inclusion significantly improves the Probit fit. We have tested an alternative specification using six less colinear variables (*Gender*, *Salary*, *Interest*, *Number of deals already done by the firm*, *Number of segments* and *Acquirer Market Value*) and the results are qualitatively similar, except that the Probit fit is worse, raising concerns about potential weak instruments.

- only one control variable is statistically significant with a stable coefficient in Panels A, B and C: the runup (the anticipation effect observed in the 30 days preceding the event window, which has a negative effect, as expected);
- one control variable is significant in Panels A, B and C but changes sign between Panel A and Panels B and C: the Acquirer Long Term Past CAR. For the pooled analysis, it has a positive sign, which switches to negative with fixed effects estimation. The fixed effects estimators (Panels B and C) are essentially determined by the time series pattern. A negative sign means that high past performing acquirers create less value in successive deals (and vice-versa). This is reminiscent of mean reversion. When taking into account the cross-sectional dimension (with pooled estimation – Panel A), the coefficient becomes positive. Despite the mean reversion, high past performers, on average, undertake better acquisitions than low past performing acquirers. This is reminiscent of momentum. Overall, these results illustrate the importance of accounting for the panel data nature of repetitive acquisitions;
- the fixed effects estimator (Panel B) confirms other results (obtained in the cross-section): past good performers create less value (Rau and Vermaelen, 1998), deals realized by bidders from active industries (*Industry Number of Deals*) are more value creating, cash deals create more value (Travlos, 1987) and higher anticipations (*runup*) reduce the observed CAR around the announcement date (Van Bommel, 2003).
- notice also that, in Panel C, the Heckman Lambda variable, which controls for the potential sample attrition bias, is not significant. Endogenous sample selection seems not to be a major concern here (except for the deal sequence number's significance). One possibility is that the *winner's curse* and *survival* biases[14] cancel each other out.

Table 5 – Panel D explores the effects of hubris on sequential CARs while controlling for both panel data and potential endogenous sample selection (by using a two-step Heckman Panel Data estimator). The first two columns use the hubris index dummy variable and the last two use the hubris index rank based variable (see Section III.C). The cross-product between deal sequence number variable and Hubris Index is added as an additional explanatory variable; the interaction coefficient should deliver information about the effect of hubris on the CAR slope across deals, a direct test of the ADR model's implications.

[14]As mentioned in Section I, corporate governance mechanisms could create a *survival biases*; i.e., later acquisitions in a sequence are done only by the sub-sample of CEOs who were not fired for bad performance in earlier acquisitions.

The interaction coefficient, between deal sequence number and hubris, turns out to be positive and significant. Note also that in every case, the value of this coefficient is higher than the absolute value of the deal sequence number's own coefficient. This implies that, while average CARs are negatively trending for rational CEOs, they are positively trending for hubris-infected CEOs; the difference is statistically significant and is robust to the Hubris Index variable definition. This constitutes strong support the ADR model's predictions. Finally, most of the control variables identified as significant in Panel C (*Acquirer's Long Term Past CAR*, *Industry Number of Deals in Year minus one*, *Private Target*, *Cash Deal* and *Runup*) retain their signs and statistical significance.

B. TBD

B.1. Econometric Methods

The time between successive deals (TBD) is measured as the months elapsed between successive acquisitions. Since TBD is strictly positive, it is what the econometrics literature calls a count data variable. Hence, we adopt GMM estimation for panel data introduced in Windmeijer (2000, 2006) to explore the behavior of TBD in a multivariate setting.[15] Concerning inference, unreported results (using, among others, a negative binomial model) indicates that we are faced with an over-dispersion problem,[16] so even though the GMM estimator should be robust to this problem, for prudence's sake we compute p-values with a bootstrap.[17]

Finally, we do not think it's necessary to control for endogenous sample selection biases when studying TBD. While the CAR is determined in a market process involving investors, potentially leading to endogenous sample attrition, TBD depends entirely on CEO decisions, so there is little reason to suspect endogeneity.

B.2. Results

[15] We used the ExpEnd Gauss program for non-linear GMM Estimation of Exponential models (see Romeu, 2004.)

[16] The Poisson estimator is most frequently used in count data models. It relies on an assumption that the expected number of counts is equal to the variance of the number of counts. When the variance is higher than the expectation, the econometric literature speaks about over-dispersion. Using a negative binomial model is a way to check for over-dispersion.

[17] Inferences drawn using bootstrap p-values are qualitatively the same as those obtained using the asymptotic p-values provided by the ExpEnd Gauss program for the main variables of interests. But some control variables are more significant according to bootstrap p-values than according to their asymptotic counterparts.

Table 6 – Panels A and B present the results using the pooled estimator and the fixed effects estimator. In each case, the deal sequence number coefficient is negative and strongly significant. This confirms the univariate results (Section III.C): the average delay between successive acquisitions is strongly decreasing. Five control variables are consistently significant and they have the same sign with both estimators:

- bidders with high industry adjusted returns on equity undertake acquisitions at a slower rate, suggesting that profitable companies study acquisitions more carefully;
- higher acquirer industry concentration (measured by Industry Assets Based HHI), is associated with less delay, suggesting that repetitive acquirers in concentrated industries are in a hurry to buy remaining targets;
- higher CEO base salary is related to longer the time between successive acquisitions, which is understandable for risk averse CEOs;
- the significant positive coefficient of Acquisition Program (Dummy variable: 1 for Bidders having made any acquisitions the previous 24 months, 0 otherwise) reveals that CEOs hired by a firm having done deals in the past two last years do deals more slowly as compared to CEOs hired by companies that have not done a deal in the previous 2-years; (keep in mind that TBD for the first deal the time between the CEO's hire date and the first deal announcement date);
- the positive coefficient of the Hostility variable indicates that CEOs take more time to prepare and announce hostile deals.

Several control variables are significant in the pooled specification (Panel A) but not with fixed effects estimation (Panel B): *Acquirer Market Value*, *Free Cash Flow – Industry Adjusted*, *the Long Term Past CAR*, *Segment Concentration*, *Industry Number of Deals (year-1)*, *Interest*, *Cash* and *Runup*. This reveals that their seeming significance is driven by a change in the cross-section of CEOs and not by the time-series dynamic of a given CEO. Hence they have little relevance for our main topic of interest, the evolution of the CEO decisions in sequential deals during an M&A program.

Tobin's q – Industry adjusted is significant in both panels but changes sign. In Panel A, which relies on the cross-section only, the coefficient is positive: higher growth opportunities are associated with slower acquisitions. However, the time series of the acquirer behavior in Panel B brings a sign reversal. One possible explanation is that Tobin's q proxies for past performance of the firm. The negative sign might indicate that a good past performance tempts a CEO to accelerate further acquisitions.

Two variables are significant using the fixed effects estimator (Panel B) and not the pooled estimator (Panel A): *Leverage – Industry adjusted* and *Private Target*. Since they are only significant when using the time-series property of the data, they probably reveal something specific about the dynamics of CEO decisions. In particular, it seems quite plausible that an increase in leverage would reduce the speed at which CEOs are willing engage in takeovers. The positive coefficient for *Private Target* is less intuitive. Since public targets are better known, perhaps there is more competition among acquirers, thus hastening takeover decisions. Perhaps CEOs have more leisure to consider private targets since other firms might be unaware of the potential synergies.

Differences between rational CEOs and hubris-infected CEOs are explored in Panels C and D of Table 6, using the same method as in Table 5, (GMM estimation to accommodate panel data.) The only difference between Panels C and Panel D is the exclusion of the *Salary* and *Interest* control variables in the latter.

Panel C shows that, for rational CEOs, the deal sequence number is negative and significant. The cross-product variable is positive and significant with both Hubris specifications. Hubris-infected CEOs accelerate less than rational CEOs during the M&A program implementation. But, in absolute value, the coefficient of the cross-product variable is significantly lower than the coefficient of the Deal sequence number variable. Consequently, these results offer only partial support for the ADR model's predictions: there is indeed a behavioral difference between rational and hubris-infected CEOs but the difference is not large enough to generate an increasing TBD trend among hubris-infected CEOs. Again, however, one might consider the influence of measurement error in the hubris index, as discussed in Section I.B. By construction, the "rational" CEOs sub-sample likely includes some who are hubris-infected, those who overbid in their first acquisition and are disappointed by the resulting synergies, which are nonetheless large enough to deliver a positive CAR. Given this unavoidable problem, partial empirical support of the ADR predictions about TBD is not all that surprising.

Panel D of Table 6 uncovers an interesting interaction between CEO remuneration and CEO learning. Removing the CEO compensation variables *Salary* and *Interest* increases the coefficient of *Deal sequence number X Hubris* and reduces the coefficient of the *Deal sequence number* alone, so that they become roughly comparable in magnitude. In words, the TBD trend

becomes almost flat for hubris-infected CEOs. This result suggests a potential interaction between a CEO's learning and his remuneration contract (see Rosen, 2004). Since the effect of learning (a reduced TBD slope for hubris-infected CEOs) seems to be more pronounced when there is no control for remuneration, learning may be partly driven by the CEO's wage contract incentives. Such a tentative interpretation clearly deserves further investigation.

V. Conclusion

Toward the end of the 1990s M&A wave, the aggregate deal value of year 2000 acquisitions initiated by US bidders reached $1.1 Trillion. With a NYSE, AMEX, and NASDAQ total market capitalization around $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 be led by hubris-infected CEOs, as suggested by recent empirical evidence? Fuller *et al.* (2002), Croci (2005), Billett and Qian (2005), Conn *et al.* (2005), Ismail (2006) and Ahern (2006) find a clear declining trend in bidders' CARs over sequential acquisitions by the same CEO. Some of these authors suggest that hubris is an explanation. Are typical US CEOs infected by hubris? The question is important, not only because of the potential to reduce resource allocation efficiency through acquisitions but how could corporate governance mechanisms offer such inadequate protection against value destruction? Why would important economic decision makers be so prone to irrationality? Yet the facts are incontrovertible: bidders' CARs do decline from deal to deal; we confirm this empirically and find no reason to suspect weaknesses in the earlier papers).

Is there an alternative explanation of the unambiguous empirical evidence? Aktas *et al.* (2006) (ADR) model the CEO M&A decision making process theoretically. Combining rationality, hubris, and learning, they reach several testable conclusions. If rational CEOs are learning, which seems plausible, they become more aggressive with experience in bidding. Consequently, in successive acquisitions, they concede an ever larger fraction of synergies to target shareholders; this implies that bidder CARs should decline from deal to deal. Hubris-infected CEOs, however, receiving negative feedback from investors about their excessive previous bids, become more cautious. This suggests an increasing trend in their CARs from deal to deal. As rational CEOs become more aggressive in bidding, the probability of takeover success increases and the elapsed time between acquisitions decreases. The reverse should be expected for hubris-infected CEOs.

Using information provided by Compustat ExecuComp, we study the behavior of 2,589 individual CEOs during the 1992-2002 period. The Thomson SDC database identifies 4,677

acquisitions made by 1,424 of them. A proxy for hubris is constructed. It is based on the CAR observed around the very first acquisition made by a particular CEO and is supported by the pattern of insider trading activities. Key results are:

- on average, observed CARs indeed decline from deal to deal. But the cross-sectional characteristics of bidders, CEOs and deals change within the sample of all acquisitions. So the CARs observed for, say, the fourth acquisition made by all CEOs who do four acquisitions, is not from the same population as the CARs from the third acquisition;
- for rational CEOs, CARs decrease in successive acquisitions and the trend is statistically significant. For hubris-infected CEOs, CARs increase and the difference in trends between rational and hubris-infected is statistically significant. This result is consistent with the predictions of the ADR model;
- endogenous sample selection biases can be controlled with a two-step Heckman procedure but they do not appear to represent a material problem since the results are similar to those obtained with simpler methods.
- on average, the interval between successive acquisitions declines over time, as predicted by the ADR model for rational CEOs who learn. This pattern is more pronounced for rational CEOs than for hubris-infected CEOs and the difference is statistically significant. Taking into account the noisy nature of any hubris proxy including the one use in this paper (an errors-in-variable issue pointed out in Aktas *et al.* (2006)), we feel it reasonable to conclude that hubris-infected CEOs also learn, but at a slower pace.

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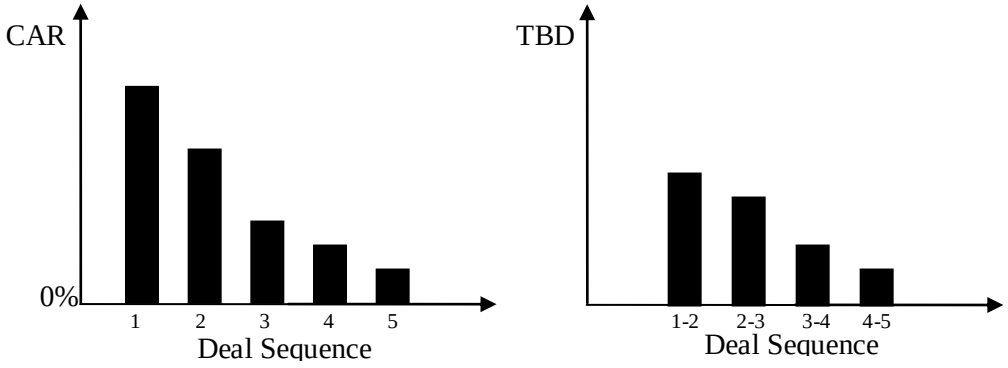
Appendix

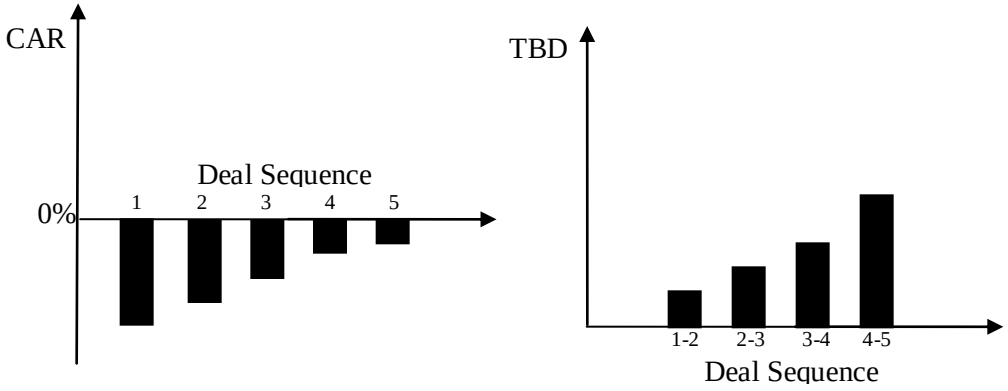
Variable	Description
Panel A. Key variables	
CAR	Bidder's announcement 11-day cumulative abnormal return centered on the announcement day. The abnormal return is calculated using the Beta-one model, which subtracts the daily market portfolio return (equal weighted CRSP index) from the daily return of the bidder.
TBD	For the first deal, the Time Between successive Deals is number of months between the CEO hiring date and the first acquisition announcement date. For subsequent deals, it is the number of months between successive acquisitions.
SEQ	The deal sequence number in the M&A program for a given *CEO-firm* couple.
Hubris Score - Rank	It corresponds to the hubris proxy (h_i) computed using the rank method described in Section II.C.3. The higher h_i, the more likely the CEO is hubris-infected.
Hubris Score - 25%	It corresponds to the dummy version of the hubris proxy; one if the hubris proxy h_i is above 0.75, and zero otherwise.
Lambda	It corresponds to the Heckman lambda, obtained from a Probit model of the probability of being included in the *CEO-firm* sample.
Panel B. CEO characteristics (Source: ExecuComp)	
Salary	The dollar value of the base salary earned by the CEO during the fiscal year.
Interest	The variable component of CEO compensation. It corresponds to the sum of the aggregate value of stock options (BLK_VALUE) and the value of restricted stock (RSTKGRNT) granted to the CEO, divided by total compensation (TDC2).
Holding	The aggregate number of shares held by the CEO as a % of the total shares outstanding.
Age	The age of the CEO at the hiring date.
Gender	Dummy variable: 1 for male CEOs, and 0 for female CEOs.
Panel C. Firm characteristics (Sources: CRSP, Compustat, Compustat Segment Database and ExecuComp)	
Long Term Past CAR	24-month cumulative abnormal return (from month -27 to month -4, relative to the announcement date).
Segment Concentration	Concentration of activities computed using a Herfindahl-Hirschman Index on sales repartition by activity segments.
Number of Segments	The number of activity segments reported in the Compustat Segment database.
Total Assets	Log of book value of total assets (item 6).
Cash Flow	Income before extraordinary items (item 18)+depreciation and amortization (item 14), scaled by the book value of total assets (item 6).
Free Cash Flow	Operating income before depreciation (item 13)–interest expense (item 15)–income taxes (item 16)–capital expenditures (item 128), scaled by the book value of total assets (item 6).
Asset Based Growth Rate	Total Assets at the end of year *t-1* minus Total Assets at the end of year *t-2*, scaled by the Total Assets at the end of year *t*-2.
Sales Based Growth Rate	Sales at the end of year *t-1* minus Sales at the end of year *t-2*, scaled by the Sales at the end of year *t*-2.
Leverage	Book value of debt (item 34+item 9) over market value of total assets (item 6-item 60+(item 25*Item 199)).
Liquidity	Current assets (item 4)-current liabilities (item 5), scaled by the book value of total assets (item6).
Market to Book	Market value of equity (item 24*item 25) divided by the book value of total common

	equity (item 60).
Price Earning	Closing stock price at the end of the fiscal year (item 199) over earnings per share (item 58).
ROE	Return on equity, which corresponds to the adjusted income before extraordinary items (item 20) over book value of total common equity (item 60).
Tobin's q	Market value of assets over book value of assets: (item 6-item 60+item 25*item 199)/item 6.
Market Value	Number of shares outstanding multiplied by the stock price one month prior to the announcement date.
Acquisition Program	Dummy variable: 1 for a Bidder having made no acquisitions in the past previous 24 months, 0 otherwise.
Runup	Bidder's 30-day cumulative abnormal return during the period (-35,-6), relative to the announcement date.
Number of deals already done by the firm	The number of acquisitions done by the firm in the 2-year period preceding the CEO hiring date.
Panel D. Bidder's industry characteristics using the 48 Fama-French industry classifications	
Industry Assets Based HHI	Industry Herfindahl-Hirschman concentration Index using total assets (item 6). The HHI is computed using all COMPUSTAT firms in the industry with valid data on total assets (item 6).
Industry Market Value Based HHI	Industry Herfindhal Index using market value of equities.
Industry Sales Based HHI	Industry Herfindhal Index using total sales.
Industry Number of Deals (year -1)	The number of deals in the bidder's industry the year before the deal announcement.
Industry Value of Deals (year - 1)	Aggregated value of deals in the bidder's industry the year before the deal announcement.
Industry Total Assets	Median total assets (log of book value) in the industry.
Industry Cash Flow	Median cash flow in the industry.
Industry Debt Ratio	Median debt ratio in the industry.
Industry Sales Based Growth Rate	Median sales based growth rate in the industry.
Industry Leverage	Median leverage in the industry.
Industry Market to Book	Median market to book ratio in the industry.
Industry Tobin's q	Median Tobin's q ratio in the industry.
Panel E. Deal characteristics	
Toehold	Percentage held by the bidder before the transaction.
Percentage Acquired	Percentage acquired by the bidder.
Deal Size	Size of the deal (in million USD).
Target Size	Estimate of the target size using *'Deal Size'* and *'Percentage Acquired'*: Deal Size*(100%/Percentage Acquired).
Number of Rival bidders	Number of rival bidders reported by SDC.
Hostility	Dummy variable: 1 for hostile deals, 0 otherwise.
Cash	Dummy variable: 1 for purely cash-financed deals, 0 otherwise.
Strategic Fit	Dummy variable: 1 when the bidder and the target are from the same Fama-French industry, 0 otherwise.
Private Target	Dummy variable: 1 for private targets, 0 otherwise.

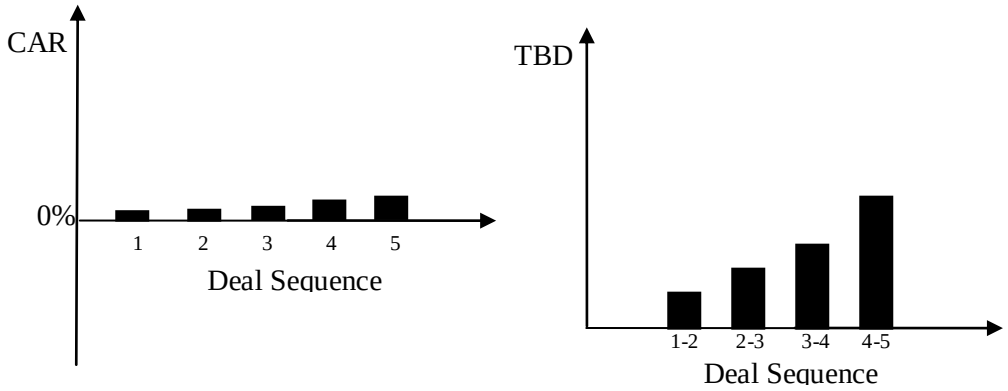
Figure 1. Aktas, de Bodt and Roll (2006) empirical predictions



Panel A. Rational CEOs



Panel B. Hubris infected CEOs – initial negative CAR



Panel C. Hubris infected CEOs – initial disappointing CAR

The X-axis represents the deal sequence number in an acquisition program undertaken by the same CEO. The Y-axis is either the ex-post observable CAR (Acquirer Cumulative Abnormal Return) or the TBD (Time Between Successive Deals). Panel A – left chart, considering rational CEOs, shows the declining pattern of ex-post observable CARs from deal to deal, as a consequence of the learning process. The associated right chart highlights the shortening TBD. Panels B and C, focusing on hubris infected CEOs, illustrate the opposite conclusion.

Table 1. CEO and M&A Sample

Panel A reports active individual *'CEO-firm'* couples by year. A *'CEO-firm'* couple is a given individual CEO combined with a particular firm; (some CEOs have been active in more than one firm). Since the ExecuComp database starts in 1992, a full history of successive CEO decisions must be restricted to CEO hired after 1991. Panel B and C report the number of acquisitions and the aggregated deal value (US$ millions). Selection criteria are: US listed acquirers, completed deals, and percentage of shares held before the deal inferior to 50%. For ease of comparison with previous results, two samples are identified. The *'Full Sample'* corresponds to all deals over one million US$, and the *'Big Sample'* to deals over one hundred million US$. The total number of deals is 28,602 and 6,108 for the *'Full Sample'* and the *'Big Sample'*, respectively.

Panel A - Active CEOs by Year

Year	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Count	159	377	605	837	1038	1223	1377	1565	1727	1803	1835
%	1.3%	3.0%	4.8%	6.7%	8.3%	9.7%	11.0%	12.5%	13.8%	14.4%	14.6%

Panel B - M&A Universe - Full Sample

Year	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Count	956	1,001	1,340	1,753	2,254	2,358	2,902	3,687	3,723	2,932	2,564	1,686	1,506
Value	77,209	71,611	88,903	163,021	204,955	318,233	437,631	659,575	1,197,734	1,029,969	1,112,749	535,033	263,412
%	3.3%	3.5%	4.7%	6.1%	7.9%	8.2%	10.1%	12.9%	13.0%	10.2%	8.9%	5.9%	5.3%

Panel C - M&A Universe - Big Sample

Year	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Count	130	137	194	250	348	419	559	828	854	830	754	445	360
Value	61,246	56,629	67,774	134,467	168,885	280,015	386,590	596,742	1,129,159	978,896	1,068,082	505,629	235,771
%	2.1%	2.2%	3.2%	4.1%	5.7%	6.9%	9.2%	13.6%	14.0%	13.6%	12.3%	7.3%	5.9%

Table 2. Sample Characteristics

Panel A displays summary statistics on acquisitions by CEO. The *'Full sample'* corresponds to all deals over one million US$, and the *'Big Sample'* to deals over one hundred million US$. The CEO sample encompasses 2,589 individuals active in 1,740 unique companies. The number of *'CEO-Firm'* couples is 2,659. They were involved in 4,677 and 2,021 M&A deals, for the *'Full sample'* and for the *'Big Sample'*, respectively. The average number of deals by *'CEO-Firm'* is 3.28 and 2.32 for the *'Full sample'* and for the *'Big Sample'*, respectively. Panel B reports the number of CEOs having done at least a given number of deals.

Panel A – Sample summary statistics

	Full sample	***Big Sample***
Number of CEOs	2,589	
Number of Firms	1,740	
Number of *CEO-Firm* Couples	2,659	
CEO-Firm with no deal	1,235	1,787
CEO-Firm with at least one deal	1,424	872
Total number of deals	4,677	2,021
Average number of deal by *CEO-Firm*	3.28	2.32

Panel B – Deals sequence statistics

	Full sample	***Big Sample***
1 deal	1,424	872
2 deals	515	455
3 deals	323	179
4 deals	193	99
5 deals	106	54
6 deals	78	30
7 deals	47	21
8 deals	45	6
9 deals	25	9
10 or more deals	91	18

Table 3. Bidder and Deal Profiles across Deal Sequence

This table describes profiles of bidders (Panel A) and deals (Panel B) across the deal sequence for the *'Full Sample'*. Each cell contains the simple average. The deal sequence (SEQ), 0 to 7, indicates that acquirers in the cell have made exactly 0 to 7 acquisitions, respectively. CEO and firm specific variables are from the year the CEO was hired, and then updated to values at the end of the year before each acquisition. *'Slope'* corresponds to the slope coefficient of a regression between the variable and the deal sequence number. All *'p-values'* are obtained using a bootstrap procedure. HHI stands for Herfindahl-Hirschman concentration Index. Variable definitions are in the Appendix.

Panel A - Bidder characteristics - Full Sample

SEQ	0	1	2	3	4	5	6	7	Slope	p-value
CEO Specific										
Salary	372	469	550	584	593	617	660	755	45.84074	0.00
Interest	0.590	0.686	0.679	0.682	0.568	0.686	0.586	0.669	-0.00048	0.34
Holding	1.26%	1.75%	0.92%	1.40%	1.61%	1.83%	0.71%	2.26%	0.00057	0.35
Age	53.23	53.96	54.25	55.06	55.57	55.75	58.65	54.70	0.46131	0.26
Gender	97.8%	97.7%	99.1%	99.0%	98.1%	98.7%	100.0%	100.0%	0.00298	0.01
Firm Specific										
Long Term Past CAR		13.03%	24.73%	23.44%	35.42%	28.41%	22.18%	14.30%	8.27011	0.80
Industry Assets Based HHI	0.104	0.104	0.109	0.098	0.094	0.077	0.104	0.103	-0.00136	0.17
Industry Market Value Based HHI	0.120	0.126	0.130	0.131	0.121	0.120	0.122	0.129	0.00003	0.48
Industry Sales Based HHI	0.087	0.092	0.095	0.089	0.090	0.074	0.090	0.090	-0.00064	0.15
Industry Number of Deals (year -1)	104.6	117.3	129.9	148.6	126.1	161.8	161.5	147.0	7.03710	0.10
Industry Value of Deals (year - 1)	22741.7	30702.6	27698.2	31360.7	32777.2	39080.9	46994.7	33886.2	2321.865	0.10
Segment Concentration	0.794	0.796	0.771	0.796	0.787	0.736	0.731	0.663	-0.01612	0.00
Number of Segments	2.201	2.213	2.310	2.272	2.453	2.514	2.564	2.923	0.09055	0.00
Total Assets	6.818	6.979	7.224	7.301	7.337	7.436	7.741	8.264	0.17386	0.00
Cash Flow	203.9	278.4	313.0	421.6	255.7	330.7	473.9	773.6	57.76525	0.20
Free Cash Flow	0.015	0.031	0.035	0.044	0.040	0.031	0.023	0.057	0.00290	0.48
Asset Based Growth Rate	0.173	0.182	0.192	0.256	0.188	0.287	0.248	0.373	0.02313	0.04
Sales Based Growth Rate	0.171	0.169	0.185	0.245	0.199	0.302	0.195	0.312	0.01691	0.12
Leverage	0.166	0.152	0.142	0.125	0.137	0.152	0.134	0.161	-0.00100	0.76
Liquidity	0.227	0.243	0.215	0.216	0.235	0.189	0.180	0.179	-0.00852	0.00
Market to Book	3.321	3.793	3.958	5.431	4.980	4.600	4.451	3.309	0.05572	0.86
Price Earning	35.297	33.955	37.019	36.018	40.121	32.687	53.749	30.138	0.64240	0.32
ROE	3.9%	9.5%	8.8%	15.7%	4.3%	1.5%	7.6%	13.1%	0.00256	0.75
Tobin's q	1.971	2.128	2.177	2.591	2.448	2.319	2.292	2.060	0.02049	0.86

Table 3– *Continued*

Panel B - Deal characteristics - Full Sample

SEQ	0	1	2	3	4	5	6	7	Slope	p-value
Toehold		0.54	0.70	0.54	1.47	0.13	0.00	0.53	-0.0428	0.21
Percentage Acquired		89.11	90.87	89.86	92.50	91.71	98.39	95.66	1.1586	0.00
Deal Size		68.44	67.72	82.78	98.96	73.82	92.11	112.18	5.4644	0.00
Number of Rival bidders		1.02	1.03	1.02	1.00	1.00	1.00	1.00	-0.0043	0.02
Hostility		0.6%	0.6%	0.5%	0.9%	1.3%	2.1%	2.2%	0.0026	0.22
Cash		56.1%	56.7%	56.0%	56.6%	43.6%	55.3%	57.8%	-0.0037	0.31
Strategic Fit		63.9%	58.2%	63.2%	65.1%	65.4%	72.3%	60.0%	0.0046	0.24
Private Target		33.2%	34.4%	30.6%	36.8%	41.0%	29.8%	22.2%	-0.0081	0.18

Table 4. CAR by Deal Sequence - Univariate Analyses

This table describes, for the *'Full Sample'* (Panel A) and the *'Big Sample'* (Panel B), acquirers and listed targets' cumulative abnormal return (CAR) and time between successive deals (TBD) by deal sequence (SEQ). Deal sequence goes from 1 to 7. The *'Full Sample'* corresponds to all deals over one million US$, and the *'Big Sample'* to deals over one hundred million US$. Panel C analyses whether the slope of the CAR with respect to deal sequence is different between rational and hubris infected CEOs. Since the first deal CAR is used to build the hubris proxy, it is excluded. The hubris proxy is the dummy variable version of the hubris rank index defined in Section 2.C. Each panel provides the median of the CAR/TBD, the number of *CEO-Firm* couples in the sample (*'N'*) and the '*p-value'* to test whether the median is statistically different from zero. *'Slope'* denotes the slope coefficient of the pooled regression between median CAR and the deal sequence number. All *'p-values'* are obtained using a bootstrap procedure.

	Acquirer CAR			**Listed Target CAR**			**TBD**		
Panel A - Full Sample									
SEQ	**Median**	**N**	**p-value**	**Median**	**N**	**p-value**	**Median**	**N**	**p-value**
1	0.63%	1,388	0.00	15.68%	405		426	1424	
2	0.19%	900	0.06	19.23%	239		224	909	
3	0.47%	579	0.07	16.10%	173		204	586	
4	0.59%	390	0.08	19.40%	110		153	393	
5	-0.16%	285	0.22	17.66%	78		119	287	
6	0.63%	207	0.49	22.42%	52		104	209	
7	-0.99%	160	0.12	18.94%	37		78	162	
Slope	-0.0016		0.11	0.0063		0.15	-30.40		0.00
Panel B - Big Sample									
SEQ	**Median**	**N**	**p-value**	**Median**	**N**	**p-value**	**Median**	**N**	**p-value**
1	0.67%	855	0.00	18.12%	238		579	872	
2	-0.72%	413	0.23	20.75%	157		308	417	
3	0.27%	236	0.49	18.87%	108		238	238	
4	-0.97%	137	0.09	19.21%	67		150	139	
5	-1.38%	84	0.11	19.81%	50		140	85	
6	-0.01%	54	0.45	21.91%	38		121	55	
7	-1.61%	33	0.23	21.73%	28		100	34	
Slope	-0.0025		0.07	0.0050		0.05	-40.10		0.00
Panel C - Full Sample – Rational versus Hubris infected CEOs									
	Rational						**Rational**		
SEQ	**Median**	**N**	**p-value**				**Median**	**N**	**p-value**
1	/	/	/				/	/	
2	0.29%	694	0.01				225	703	
3	0.44%	466	0.10				200	473	
4	0.70%	318	0.13				146	321	
5	-0.26%	231	0.20				111	233	
6	-0.36%	165	0.31				98	167	
7	-1.51%	130	0.14				77	131	
Slope	-0.0035		0.03				-30.88		0.00
	Hubris						**Hubris**		
SEQ	**Median**	**N**	**p-value**				**Median**	**N**	**p-value**
1	/	/	/				/	/	
2	-0.67%	206	0.31				224	206	
3	1.30%	113	0.19				227	113	
4	-1.24%	72	0.21				170	72	
5	0.22%	54	0.43				170	54	
6	1.41%	42	0.13				143	42	
7	-0.58%	30	0.18				79	31	
Slope	0.0006		0.42				-27.9		0.00

Table 5. CAR by Deal Sequence - Multivariate Analyses

Panel A presents pooled regressions of the CAR on the deal sequence number. Panel B estimates CAR determinants with a fixed panel data regression. Panel C presents results using a two-step Heckman Panel Data estimator. Panel D compares rational and hubris-infected CEOs using a two-step Heckman Panel Data estimator. The hubris proxy is either the dummy version or the hubris rank index defined in Section 2.C. *'Coef'* corresponds to the estimated coefficient of the corresponding variable. *'N'* denotes the number of *'CEO-firm'* couples in the sample. *'R²'* is the coefficient of determination. The *'Fisher'* statistic and its corresponding *'p-value'* are also provided for each regression. All *'p-values'* are obtained using a bootstrap procedure. HHI stands for Herfindahl-Hirschman concentration Index. Variable definitions are in Appendix.

	Panel A		**Panel B**		**Panel C**		**Panel D**			
	Pooled Estimator		**Fixed Estimator**		**Heckman Panel Data**		**Hubris Dummy**		**Hubris Score**	
Independent Variable	**Coef**	**p-value**	**Coef**	**p-value**	**Coef**	**p-value**	**Coef**	**p-value**	**Coef**	**p-value**
Constant	0.0567	0.13								
Deal sequence number	0.0001	0.90	-0.0006	0.43	-0.0075	0.54	-0.0164	0.17	-0.0530	0.00
Deal sequence number x Hubris Index							0.0414	0.00	0.0914	0.00
Acquirer Market Value	-0.0036	0.10	-0.0061	0.13	0.0000	0.97	0.0000	0.94	0.0000	0.73
Tobin's q – *Industry Adjusted*	0.0021	0.46	0.0008	0.86	0.0017	0.80	0.0024	0.70	0.0031	0.62
Free Cash Flow – *Industry Adjusted*	-0.0120	0.78	-0.0092	0.94	-0.1073	0.31	-0.1046	0.31	-0.1121	0.29
Leverage – *Industry Adjusted*	-0.0043	0.82	0.0527	0.14	-0.0042	0.94	-0.0127	0.86	-0.0244	0.71
Price Earning – *Industry Adjusted* [x10^2]	-0.0063	0.11	0.0006	0.94	0.0031	0.76	0.0030	0.76	0.0002	0.99
ROE – *Industry Adjusted*	-0.0114	0.02	-0.0073	0.35	0.0300	0.31	0.0253	0.38	0.0216	0.45
Long Term Past CAR	0.0070	0.03	-0.0107	0.02	-0.0254	0.00	-0.0240	0.00	-0.0235	0.00
Segment Concentration	0.0016	0.89	0.0274	0.12	0.0371	0.13	0.0372	0.12	0.0328	0.16
Industry Assets Based HHI	0.0292	0.23	0.0302	0.60	0.0027	0.97	0.0017	0.98	0.0121	0.88
Industry Number of Deals (year-1) [x10^2]	0.0009	0.63	0.0015	0.04	0.0258	0.00	0.0283	0.00	0.0269	0.00
Salary [x10^2]	-0.0002	0.91	-0.0008	0.70	-0.0020	0.50	-0.0024	0.44	-0.0023	0.46
Interest	0.0054	0.04	0.0005	0.91	0.0006	0.92	-0.0010	0.88	-0.0034	0.62
Private Target	0.0064	0.32	0.0055	0.42	0.0132	0.00	0.0126	0.00	0.0125	0.00
Cash	0.0074	0.24	0.0160	0.01	0.0117	0.07	0.0104	0.10	0.0108	0.08
Acquisition Program	0.0100	0.25	0.0057	0.66	0.0007	0.94	0.0010	0.91	0.0016	0.86
Number of rival bidders	-0.0183	0.02	-0.0034	0.85	-0.0067	0.43	-0.0062	0.45	-0.0060	0.46
Hostility	0.0144	0.54	0.0080	0.74	0.0275	0.39	0.0292	0.37	0.0282	0.38
Runup	-0.0400	0.01	-0.0527	0.00	-0.0649	0.00	-0.0611	0.00	-0.0597	0.00
Strategic Fit	0.0012	0.78	-0.0015	0.77	-0.0048	0.42	-0.0064	0.28	-0.0055	0.35
Lambda					0.0004	0.99	0.0023	0.89	0.0022	0.89
N	2,872		2,872		1,323		1,323		1,323	
R²	1.90%		41.40%		4.30%		5.90%		7.80%	
Fisher	2.8	0.00	1.6	0.00	2.93	0.00	3.85	0.00	5.24	0.00
	Hausman Test (Random vs Fixed Effect)									
	Chi2		33.48	0.03						

Table 6. Time between successive deals (TBD) - Multivariate Analyses

This table provides multivariate analyses of TBD (the time in months between successive acquisitions) for the *'Full Sample'*. Panel A reports GMM Pooled estimation. Panel B presents results from GMM Fixed Panel Data estimation. Panels C and D investigate, using GMM Fixed Panel Data estimation, the differences between rational and hubris-infected CEOs. The hubris proxy is either the dummy version or the hubris rank index defined in Section 2.C. *'Coef'* denotes the estimated coefficient of the corresponding variable. *'N'* is the number of *CEO-firm* couples in the sample. All *'p-values'* are obtained using a bootstrap procedure.. HHI stands for Herfindahl-Hirschman concentration Index. Variable definitions are in the Appendix.

	Panel A		**Panel B**		**Panel C**				**Panel D**			
	Pooled Estimator		**Fixed Estimator**		**Hubris Dummy**		**Hubris Score**		**Hubris Dummy**		**Hubris Score**	
Independent Variable	**Coef**	**p-value**	**Coef**	**p-value**	**Coef**	**p-value**	**Coef**	**p-value**	**Coef**	**p-value**	**Coef**	**p-value**
Constant	3.8389	0.00										
Deal sequence number	-0.0665	0.00	-0.1285	0.00	-0.1357	0.00	-0.1709	0.00	-0.0623	0.00	-0.0968	0.00
Deal sequence number x Hubris					0.0374	0.00	0.0873	0.00	0.0515	0.00	0.0923	0.00
Target Size	0.0057	0.30	-0.0083	0.30	-0.0084	0.41	-0.0087	0.28	-0.0153	0.11	-0.0158	0.18
Acquirer Market Value	-0.1216	0.00	-0.0361	0.89	-0.0334	0.70	-0.0287	0.99	0.1173	0.00	0.1220	0.00
Tobin's q – *Industry Adjusted*	0.0245	0.05	-0.0743	0.00	-0.0765	0.00	-0.0792	0.00	-0.1156	0.00	-0.1189	0.00
Free Cash Flow – *Industry Adjusted*	-0.3954	0.06	0.1444	0.60	0.2083	0.45	0.2012	0.53	0.6943	0.00	0.6793	0.00
Leverage – *Industry Adjusted*	-0.0226	0.72	0.7222	0.00	0.7155	0.00	0.6968	0.00	1.0532	0.00	1.0435	0.00
Price Earning – *Industry Adjusted* [x10^2]	0.0004	0.14	0.0005	0.08	0.0006	0.06	0.0005	0.06	0.0008	0.00	0.0007	0.00
ROE – *Industry Adjusted*	0.1753	0.01	0.1623	0.05	0.1624	0.01	0.1605	0.00	0.1268	0.09	0.1226	0.12
Long Term Past CAR	0.0763	0.00	-0.0394	0.43	-0.0372	0.14	-0.0324	0.45	-0.0270	0.37	-0.0216	0.56
Segment Concentration	0.1717	0.01	0.0239	0.91	0.0243	0.65	0.0211	0.92	-0.0737	0.08	-0.0762	0.25
Industry Assets Based HHI	-0.8336	0.00	-1.4194	0.00	-1.4209	0.00	-1.4148	0.00	-1.2091	0.00	-1.1918	0.00
Industry Number of Deals (year-1) [x10^2]	-0.0003	0.05	0.0001	0.75	0.0001	0.61	0.0001	0.80	-0.0003	0.05	-0.0003	0.03
Salary [x10^2]	0.0007	0.00	0.0019	0.00	0.0019	0.00	0.0019	0.00				
Interest	-0.0721	0.00	-0.0513	0.22	-0.053	0.17	-0.0580	0.15				
Private Target	0.0074	0.74	0.0972	0.00	0.0977	0.00	0.0973	0.00	0.0800	0.00	0.0805	0.00
Cash	-0.0460	0.05	-0.0311	0.26	-0.0308	0.36	-0.0314	0.30	-0.0058	0.81	-0.0069	0.77
Acquisition Program	1.0196	0.00	0.9293	0.00	0.9276	0.00	0.9291	0.00	0.9341	0.00	0.9369	0.00
Number of rival bidders	0.0593	0.15	0.0132	0.79	0.0148	0.74	0.0160	0.77	0.0066	0.90	0.0071	0.87
Hostility	0.1673	0.07	0.3213	0.00	0.3285	0.02	0.3230	0.00	0.3543	0.02	0.3482	0.03
Runup	0.2614	0.00	0.1547	0.41	0.1559	0.30	0.1660	0.32	0.2870	0.00	0.2985	0.00
Strategic Fit	-0.0204	0.29	0.0090	0.77	0.0083	0.63	0.0103	0.73	-0.0138	0.60	-0.0113	0.70
N	2.213		2.213		2.213		2.213		2.213		2.213	