

## Abstract

### The Effect of Takeovers on Shareholder Value

This study uses a comprehensive sample of tender offers from 1963-97 to estimate average value improvements from takeover as perceived by investors. We estimate value effects using conventional announcement-period abnormal returns, and with two new approaches: the *probability scaling* method, based on rescaling of short-window returns; and the *intervention method*, which uses returns associated with the announcement of a competing bid. The new methods evade the estimation dilemma of either including only a partial estimate of the value effect of the transaction, or using long post-announcement windows that introduce severe execution date, noise and benchmark error. The intervention method further escapes a bidder-revelation bias present using traditional methods. We find that investors perceive value improvements from tender offers on average to be large and positive (about 50% of target value). We also examine the economic determinants (means of payment, hostility of the bid, focusing versus diversifying transactions, regulatory environment, relative bidder/target sizes) of the value improvements and revelation biases in different transactions.

Numerous papers have studied the stock market valuation effects of takeovers. It would therefore be reasonable to expect the question of how much takeovers improve firm value to be as fully resolved as standard databases permit. Building on this previous work, this paper offers new methods of estimating shareholder value improvements from takeover. The resulting estimates are much larger than those implied by traditional methods.

There are two important challenges to estimating value effects of takeovers. We call the first challenge the *dilemma of window length*. Since not all takeover bids succeed, a short event window that extends only a few days past the bid announcement date estimates only a fraction of the value effects of successful takeover.<sup>1</sup> A long window that extends through successful completion of the transaction can capture the full value effects. However, this comes at the cost of introducing much greater noise and benchmark errors, and raises questions of the right method of compounding long-term returns.

The second challenge, which we call the *revelation bias*, is that the bidder's return on announcement reflects not just news about the combination, but news about the stand-alone value of the bidder. This can occur both because bidders sometimes deliberately time the announcement of offers on the same day as unrelated negative announcements<sup>2</sup>, and because the very fact of the bid conveys information to investors about stand-alone value (as discussed further below).

This study uses a comprehensive sample of tender offers that extends from July 1963 through December 1997 to estimate the stock market's perceptions of perceived value improvements from takeover. We estimate value improvements using both conventional abnormal stock returns associated with the initial bid, and two new approaches. The first, the Probability Scaling Method (*PSM*), uses returns associated with the announcement of the initial bid. Like traditional methods, the return cumulation window extends only a short time after the event. *PSM* then adjusts returns derived from this 'short' window upward to reflect the probability that the offer will fail. This approach better exploits the information in short windows to capture a missing slice of the gains from takeover. It thereby partly evades the dilemma of window length.

The second approach, which we call the Intervention Method (*IM*), is based on returns associated with intervening events such as the announcement of a competing bid. The

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<sup>1</sup>More precisely, it estimates a mixture of the gain from takeover by the first bidder and by a possible later bidder that may appear.

<sup>2</sup>For example, the *WSJ* 'Heard on the Street' column reported: "It's Wall Street's version of 'Wag the Dog.' Over the past week, both Mattel and Coca-Cola have announced acquisitions on the same day they also issued warnings about disappointing earnings. ... No one is suggesting that either company unveiled its acquisition solely to divert attention from its problems... But it is also clear that the acquisitions, like the [Iraq] bombings, helped shift attention away from other less favorable developments." The article gives other examples as well (*WSJ*, 12/18/98, p. C1).

intervention method goes further in evading the estimation dilemma mentioned above. Furthermore, the intervention method eliminates the revelation bias, discussed further below, which taints estimates of the gain to takeover in past market and accounting studies.

Based on conventional short-event-window returns, our mean estimate of the value improvement associated with the arrival of an initial bid during 1962-97 is approximately 29% of the value of the target, or 5.9% of combined value. Using *PSM*, our mean estimate of the value improvement is larger—approximately 50.4% of the value of the target. (In the current version this is with an unduly short pre-event window of 5 days. In the next revision a longer pre-event window will be used, which we expect will increase the *PSM* estimate.) Using *IM*, our mean estimate of the value improvement is approximately 50% of the value of the target, or 16% of combined bidder/target value. (See Section IV.C for a comparison with initial bid return results from some previous studies, and Table 3 for a calculation of *IRATIO* based on data from other studies.)

The mean estimated improvement as a fraction of target value using the intervention method is lower for hostile than for friendly offers, is lower for ‘mergers of equals’ than for bids by much larger bidder for a smaller target, and is similar for pre-and post- Williams Act offers. Also, the mean estimated value improvement is smaller than, but not significantly different from the average bid premium, so there is no evidence that bidders on average profited from takeover. Hence, most of the average successful bid premium can be explained by value improvement. There is no sign of increased average value improvements from takeovers during the merger boom of the mid-to-late 1990’s.

There is a large previous literature that uses stock return data to estimate value improvements from takeovers. Many studies have separately estimated bidder or target gains. These estimates reflect the total gain from combination, but also depend on how this surplus is divided between bidder and target.<sup>3</sup> To estimate the total gains from combination, Bradley, Desai and Kim (1988), hereafter BDK-88, examined a market-value-weighted average of abnormal returns of paired bidders and targets in successful takeovers. They examined an event window that extends to 5 days after the initial announcement of the ultimately successful bid. Since there is substantial uncertainty about success 5 days after the bid, the literature therefore provides us only with an estimate of a fraction of the total gains from takeover. BDK-88 find that the market-value-weighted average of bidder and target abnormal returns for successful takeovers during the period 1963-1984 is positive and stable over this period, with an average increase of 7.4% of combined bidder/target market value.

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<sup>3</sup>Numerous studies find significant and large positive average abnormal returns for target shareholders. [Jensen and Ruback (1983) and Jarrell, Brickley, and Netter (1988) review this evidence; more recently, see Schwert (1996).] In contrast, abnormal returns for takeover bidders tends to average fairly close to zero.

Ideally, in such studies, an event window that extends from (well before) the initial announcement through final successful resolution should be used to capture the full value effects of takeover. The dilemma of window length is important in takeover contests because such contests often take as long as 3-6 months between first announcement and final resolution. Such long periods introduce a great deal of noise arising from random price movements and errors owing to misestimation of benchmark returns. Long periods also raise issues of the correct way to compound.<sup>4</sup> Adding to the estimation problem is that it is hard to get accurate final resolution dates for takeovers. A short post-announcement window minimizes such noise and benchmark error, but excludes much of the value effect of the successful transaction.<sup>5</sup>

Several authors have emphasized a second problem for estimating value effects of takeovers, which is that the announcement of an offer and its form reveals information possessed by management about the bidder's stand-alone value.<sup>6</sup> As a result, takeover-related returns do not provide a pure measure of gain from takeover. For example, the fact of a bid may convey the good news that a bidder expects to have high cash flows, the bad news that the bidder has poor internal investment opportunities (see, e.g., McCardle and Viswanathan [1994]; the *WSJ*, 12/18/98, p. C1, Heard on the Street describes the viewpoint of analysts that "Executives who see slowing growth often look outside their companies for acquisition opportunities."), or the bad news that the bidder's management has empire-building propensities. Similarly, a high premium can convey good or bad news about the bidder's stand-alone prospects. Also, theory predicts that the use of equity as a means of payment will convey bad news about the bidder, and the use of cash will convey good news, owing to adverse selection problems with equity issuance.<sup>7</sup> It follows that the market-value-weighted average of bidder and target equity returns provides a biased estimate of the long-run total equityholder gain from takeover. We term the error in these estimates arising from managers' information about stand-alone value the *revelation bias*.<sup>8</sup>

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<sup>4</sup>The market model is biased to the extent that bids occur after the bidder has experienced abnormally good times (see Franks, Harris, and Titman [1991]). Barber and Lyon (1997), and Kothari and Warner (1997) study the challenges of using long-horizon returns, and analyze the effectiveness of alternative benchmarks.

<sup>5</sup>A familiar problem, which is not our primary focus, is that a short *pre-event* window will omit the effects of probability revisions associated with information 'leaking out' prior to the official public announcement date.

<sup>6</sup>See, e.g., Bradley, Desai and Kim (1983), Jensen and Ruback (1983), and Roll (1986).

<sup>7</sup>See Myers and Majluf (1984), Hansen (1987), Fishman (1989), Eckbo et. al., (1990), and Berkovitch and Narayanan (1990); and the evidence of Franks et. al., [1988].

<sup>8</sup>Bidder revelation effects should not be equated with *signalling*, which is the special case in which the bidder modifies his decision of whether to make an acquisition in order to influence short-term market perceptions. In general bidder actions will convey information to the market, regardless of whether the bidder has any strong desire to alter market beliefs. Signalling motives are probably much less important

An alternative to stock market evidence is to examine accounting or other performance measures following completed transactions. Several studies have drawn very different conclusions about whether takeovers on average increase or decrease fundamental value.<sup>9</sup> Although such studies are quite informative, they usually do not quantify the total discounted value effect of takeovers. More importantly, these studies are potentially subject to problems of noise, benchmark error, and revelation bias analogous to those of stock market-based studies. For example, in regard to revelation bias, an offer may reveal prospects for future accounting improvements which would have occurred even without a takeover.

This paper makes two main contributions. First, it examines empirically abnormal stock returns associated with announcement of takeover bids in a sample that extends to the late 1990s. Second, it offers new methods of addressing the dilemma of window length and the revelation bias inherent in stock market studies. In doing so, it offers methods which may be useful in other contexts as well for estimating full value effects of corporate events, and of disentangling revelation effects from value effects of discretionary corporate actions.

Both new approaches address the estimation dilemma. Consider, for example, the problem that if the event window is truncated 5 days after announcement, then the market price at the endpoint still reflects substantial uncertainty on the part of investors about ultimate success of the offer or of any followup offer. The probability scaling method (*PSM*) adjusts returns for this residual uncertainty about transaction completion. (*PSM* does not improve over conventional methods in addressing pre-public-announcement anticipation of the event.) In this method, ex post data on success of bids is used to estimate the probability, given that a bid has taken place, that a bidder ultimately succeeds in acquiring the target; and the probability that some bidder ultimately takes over the target. Based on these probabilities, the cumulative returns of bidder and target are magnified to measure the value effect of a virtual completed transaction (rather than the effect of having only a probability that the transaction will be successful). Just as an anthropologist can infer characteristics of a hominid such as its height based on a fossilized leg bone, *PSM* offers an estimate of the whole value gain using a fragment of this gain. The resulting estimate avoids the large expansion in window length associated with cumulating bidder and target through success of the acquisition.

Like *PSM*, the intervention method (*IM*) addresses the estimation dilemma arising from residual post-announcement uncertainty about transaction success. The intervention

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than fundamental value considerations in the decision of whether to make an acquisition. It is, however, not implausible that signalling motives would affect the exact timing of bid announcement.

<sup>9</sup>See, e.g., Mueller (1985), Healy, Palepu, and Ruback (1991), Jarrell (1996), Kaplan and Weisbach (1991), Opler and Weston (1990), Jarrell (1996), and Bhagat, Shleifer, and Vishny (1990).

method goes further to address the revelation bias, by focusing on the returns to the initial bidder when a competitor arrives. The associated stock return is informative about value improvement<sup>10</sup> because the arrival of a second bidder has a large effect on the probability of the initial bidder’s success. The abnormal return observed for the initial bidder at this event therefore implicitly reflects the size of the takeover improvement. Furthermore, this event does not occur at the discretion of the initial bidder; it is an *external intervention*. This is crucial, because it means that the arrival of a competing bid will reveal little or nothing about the stand-alone value of the initial bidder. The goal of the intervention method is to calculate the value improvement implied by the observed abnormal return of the initial bidder when a competing bid intervenes.

There are two crucial inputs to this calculation. The first input is the effect of the arrival of a competing bid on the probability that the first bidder succeeds in acquiring the target. The second input is the effect of the arrival of a competing bid on the expected price that the first bidder will pay should it win the contest.<sup>11</sup> Each of these quantities can be estimated directly from *ex post* data. Holding constant these quantities, the abnormal return is algebraically decreasing with the size of the takeover improvement. Inverting this relationship, the size of the takeover improvement can be inferred from the observed abnormal return. A numerical illustration is provided in the next section.

Intuitively, the challenge for estimating value improvements is that two very different possibilities are consistent with a negative market reaction. First, the acquisition may increase value a lot for the first bidder, and arrival of the second bidder decreases the probability that this value is realized by the first bidder. Second, the acquisition may decrease the first bidder’s value, but the arrival of the second bidder elicits a higher successful premium from the first bidder. To disentangle the effects of shifts in success probability versus expected price paid, we model the relation between these parameters and stock prices.

Previous papers that have examined stock price reactions to events that interfere with takeovers have focused either on testing for collusion and the effects of antitrust enforcement, or simply documenting the abnormal returns associated with this event. Eckbo (1983) finds negative abnormal stock returns in merger bidders and targets on the announcement of an antitrust complaint. Wier (1983) finds negative abnormal stock returns in firms that are subject to antimerger lawsuits when the cases are decided against them. Bradley, Desai and Kim (1983) find a negative stock price reaction for a bidder upon announcement of

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<sup>10</sup>The term “value improvement” in this paper refers to joint bidder and target shareholder gains. It therefore includes any wealth redistributions from other claimants that raise shareholder value.

<sup>11</sup>A third relevant input, the initial shareholding of the first bidder in the target, turns out to be relatively unimportant.

a competing bid. Our paper has a different focus, estimating value improvements from takeover and disentangling value changes from revelation effects.

Our estimates of value improvement lead to seven main results. (Some of these findings are tentative, and are subject to further fine-tuning described in the text of our implementation of the methodology.) First, takeover improvements from tender offers are perceived by investors to be large and positive. For example, based on *IM* takeover improvements are positive in over 95% of the sample (123 out of 129 transactions), and to be on average 50.6% of target value. Results are very similar using *PSM*, with positive measured improvements in 89% of the sample, and a mean of 50.4%. The conclusion that takeover improvements are on average positive and substantial is robust with respect to both model specification and empirically plausible variations in the estimated parameters.

The similarity of the *IM* and *PSM* estimates suggests that in the overall sample average revelation effects are close to zero. This does not, however, mean that revelation effects in all categories of transactions. There is some indication of time variation in revelation effects, with apparent changes in mean effect as the structure of the takeover environment shifts. We are current exploring whether there are revelation effects are related to offer characteristics such as means of payment and offer hostility.

Second, the average perceived value improvement is much larger than mean estimates based on short-window initial bid returns. Using a traditional approach such as that in BDK-88 yields an estimated mean improvement of 29.3% of target value. Thus, the mean estimate of value improvement as a percentage of target value is higher by more than 21% of target value using either *IM* or *PSM* rather than the traditional approach!

Third, there is no evidence that tender offer bidders profit from buying targets. Average value improvements are not significantly different from the average premia paid. Thus, most of the average successful premium paid can be explained by value improvement.<sup>12</sup>

Fourth, estimated average value improvements are similar in the periods pre- and post-Williams Act and associated legislation. This is interesting since several authors have documented changes in premia and several other takeover-related variables beginning at approximately this time (though explanations differ as to the source of these changes). Our finding is consistent with the notion that equilibrating forces lead to approximate constancy

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<sup>12</sup>This bears on the interpretation of studies of post-takeover performance. For example, Bhagat, Shleifer and Vishny (1991) point out that the gains from 1980's bustup takeovers may have been derived from selling off target assets at inflated prices. Kaplan and Weisbach (1991) estimate positive asset sale profits from acquisitions over several decades that were later divested. They also recognize that the possibility of systematic overpayment by later purchasers qualifies the conclusion that profitable acquisitions actually improved value. If overpayment was limited, the prices at which assets were sold during our sample period may not have been severely inflated.

in average value improvements despite changing conditions in the corporate control market change.

Fifth, acquisitions by a large bidder of a small target create a greater value improvement, measured as a fraction of target value, than combinations of similar-sized firms. This is consistent with at least two possibilities: (1) that the business benefits of acquiring a target can be ‘leveraged’ more when combined with a larger firm, or (2) that cultural clashes are more severe in ‘mergers of equals.’ This effect seems to be present using traditional initial returns, but is stronger using *IM*.

Sixth, there is no sign that average value improvements from takeovers as a fraction of target value were especially high during the merger boom of the mid-to-late 1990’s relative to the overall sample period. These transactions do appear to have created large absolute value increases because of their large scale.

Finally, value improvements as a fraction of target value are smaller for hostile than for friendly transactions. In contrast, there is little difference in the value improvements as a fraction of combined bidder-target value. The reason for these differences remains to be explored.

The next section develops an empirical measure of value improvements. Section II describes the data. Value improvement estimates are presented in Section III. Section IV analyzes robustness and develops extensions. The final section concludes.

## **I Empirical Measure of Value Improvements**

The basic ideas of *PSM* and *IM* are best illustrated by numerical examples.

### **A Numerical Illustration of the Probability Scaling and Intervention Methods**

#### **The Probability Scaling Method**

Consider a bidder who does not own any shares of the target. Suppose that the stand-alone value of the target is 100, the stand-alone value of the bidder is 200, and that the transaction will create a value improvement of 40. Suppose that just prior to the initial bid the market assesses the probability of a bid to be close to zero, and that just after the initial bid the probability of offer success is perceived to be .6. Then the stock market’s assessment of the combined bidder-target expected value prior to the initial bid is approximately

$$100 + 200 = 300.$$



Just after the initial bid, this assessment is revised to

$$100 + 200 + .6(40) = 324.$$

The combined bidder-target equity return is therefore

$$\frac{324}{300} - 1 = 8.0\%.$$

This is only a fraction of the percentage value improvement, which is  $40/300 = 13.\bar{3}\%$  of combined value.

The *PSM* grosses up the equity return by the probability of success, which gives the total value gain of a virtual completed transaction,

$$\frac{8.0\%}{.6} = 13.\bar{3}\%$$

of combined bidder-target value.

The implementation of *PSM* is slightly more complex than this illustration, because the target return reflects the market's belief about the likelihood that the target will be acquired by any bidder, not just the first bidder. Subsection C derives *PSM* in detail.

## Numerical Illustration of The Revelation Bias

We now illustrate the revelation bias inherent in the conventional approach to estimating takeover value improvements. To begin with, let there be no value improvement from successful takeover, so that stand-alone and post-takeover discounted value of target cash flows are both \$100. Suppose that prior to the initial bid, the market estimates the stand-alone value of the bidder to be \$200. Suppose that a bid reveals favorable news to the market about *stand-alone* bidder value, so that the post-initial-bid market assessment of stand-alone bidder value is \$250. The \$50 discrepancy is the effect the bid has on the market's assessment of stand-alone value.

The stock market's assessment of combined bidder-target value prior to the initial bid is

$$100 + 200 = 300.$$

Just after the initial bid, this assessment is revised to

$$100 + 250 = 350.$$

The combined bidder-target equity return will therefore be

$$\frac{350}{300} - 1 \approx 16.7\%.$$

If the revelation effect of the initial bid is ignored, this will be wrongly be attributed by researchers to an expected value improvement of  $.166 \times \$300 = \$50$  (50% of target value), when in fact the improvement is zero. As Roll (1986) pointed out, even a modest revelation effect for the bidder can create a large overestimate of the percentage improvement in target value from takeover, since on average bidders are much larger than targets.

## The Intervention Method

Since competition reduces a first bidder's probability of success, *ceteris paribus* its stock price will drop if its value improvement is large compared to the expected price that will be paid, and rise if the value improvement is less than the expected purchase price. Thus the stock price reaction to a competing bid provides information about the value improvement. However, holding probability of success constant, competition should hurt the first bidder to the extent that he is forced to pay more when he wins. The problem for the intervention method is to disentangle these two effects.

The intervention method focuses on the period after the initial bid, when the market's assessment of stand-alone bidder value is \$250. We will compare a case of positive value improvement, where the value of the target managed by the bidder is \$140, with the case of zero improvement, where the post-takeover NPV of target cash flows if managed by the bidder is \$100. We begin with the positive improvement case.

Suppose that at the time of the initial offer, the probability of the initial bidder succeeding is .6, but that if a competitor makes a bid, this probability is only .4. (These overall probabilities take into account the possibility that a competing bid may be forthcoming.) Suppose that at the time of the initial offer, the expected price that the first bidder will have to pay *if he succeeds* is \$120, but that if a competitor arrives, this expected price paid by the first bidder rises to \$130. Based on this information, the stock price of the bidder after announcing his offer rises to

$$250 + .6(140 - 120) = 262.$$

If a competitor appears, the first bidder's stock price retreats to

$$250 + .4(140 - 130) = 254.$$

Thus, the first bidder's stock return on the arrival of a competing bidder is  $(254 - 262)/262 \approx -3\%$ .

The initial bidder's stock return reflects the facts that when a competing bid arrives, (1) the first bidder will have to pay more if he succeeds, and (2) the first bidder has a

lower probability of succeeding. Clearly point (1) contributes negatively to the first bidder's return. Point (2) also contributes negatively to the stock return here, because a lower probability of success prevents the bidder from realizing profits. These profits are the difference between the improvement brought about by the first bidder and the expected price paid. Thus, *the first bidder's stock return on the arrival of a competing bid reflects the market's assessment of the value improvement that the first bidder can bring about.* Specifically, the larger the improvement, *ceteris paribus*, the more negative the return. And if the improvement is smaller than the expected price, then point (2) will contribute *positively* to the bidder's return.

These points are illustrated by making one change in the example. Suppose now that the takeover does not improve value, so the value of the target when acquired is the same as its stand-alone value of \$100. Replacing \$140 with \$100 in the above calculations shows that the bidder's stock return on the arrival of a competing bidder is 0%. The negative effect of the higher price that will be paid in the event of success is offset by the positive effect of an increased probability of failure.

The intervention method uses *ex post* data to estimate the various parameters of this numerical example: the unconditional probability of success of an initial bidder, the probability of success given the arrival of a competitor, the unconditional expected price paid by an initial bidder given that he succeeds, and the expected price he pays if he succeeds given that a competing bid occurs. Given these parameters (along with the initial shareholding of the bidder in the target), the value improvement from the takeover implies a specific stock return for the first bidder. It is therefore possible to infer backwards from the observed stock return to the size of the value improvement.<sup>13</sup>

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<sup>13</sup>The above discussion is based on a sharp distinction between *creation* of value and *revelation* about value. It could be argued that an action can create value as a direct result of revealing value. For example, if a takeover bid conveys to the market the idea that the bidder's prospects are good, customers or suppliers may be more willing to deal with the firm. If so, even a manager whose sole objective is to maximize fundamental value may take costly actions in order to reveal information. These issues are discussed in Appendix A. The main point is that even if revealing information affects fundamental value, it is still crucial to distinguish between value created and value revealed. Generally, these quantities will be of different orders of magnitude and need not even have the same sign. Thus, even in a setting where revelation affects fundamental value, the increase in stock price associated with a corporate action is an invalid measure of the effect of that action on underlying value. Furthermore, even if the announcement of a takeover bid increased *underlying value* significantly, this gain from revelation is not an actual benefit from combination per se. As discussed in Appendix A, the intervention method (1) is consistent with possible effects of value revelation on fundamental value; (2) is consistent with, but does not require signalling motivations; and (3) estimates only those value improvements that result from combination of the two firms, not those that result from value revelation.

## B Hypotheses

The primary issue to be examined is whether takeovers on average increase the joint value of the bidder and target firms. We also examine whether successful bidders on average gain from acquisitions. According to Roll's (1986) Hubris Hypothesis, there is no value improvement from takeover; takeovers occur because of positive valuation errors by bidding managers. Agency problems can also lead bidding managers to pay more for targets than they are worth (e.g., "empire-building," and misuse of free cash flow). We therefore call the hypothesis of zero value improvement the *Strong Agency/Hubris Hypothesis*.

If the *Strong Agency/Hubris Hypothesis* obtains, the expected value of the target to the bidder is the pre-takeover market price of the target. If bidding costs are neglected, then the bidder makes negative profits equal in magnitude to the total premium paid for the purchased shares.

Since tender offers are frequently for less than 100% of outstanding shares, estimated bidder profits will depend on the assumptions made about the price paid for remaining shares given that control is obtained. For two reasons, the most natural assumption is that the same price is paid for holdouts as for the shares purchased in the tender offers.<sup>14</sup> First, fair-price antitakeover amendments require paying at least this much to minority shareholders. Second, even if the bidder is able to exploit control by expropriating minority shareholders, such opportunities for dilution should be fully reflected in the initial bid price, so that holdout shareholders on average receive the same price as tendering shareholders (see Grossman and Hart [1980]).

Let  $\alpha$  refer to the fraction of the target's shares owned by the first bidder prior to the bid. Let  $B$  be the price ultimately paid by a successful first bidder for shares purchased in or subsequent to the tender offer. We assume that the same price is paid for shares in the tender offer and for the remaining shares (excepting any 'toehold' shares already owned by the bidder). For convenience we scale  $B$  to be the notional price that would be paid if the bidder purchased the entire firm. Thus, the amount actually paid is  $(1 - \alpha)B$ . The price of the target could be the amount of cash paid to target shareholders, the market value of security claims upon the combined firm given to target shareholders, or some combination thereof.

Let  $V_0^T$  be the nontakeover value of the target. Let the combined post-takeover value of the first bidder and the target be denoted  $V^C$ , and let the non-takeover value of the bidder be denoted  $V_0^B$ . Let  $V^I$  be the value improvement from takeover, and let  $P$  be actual cash

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<sup>14</sup>Comment and Jarrell (1987) present evidence consistent with this assumption. More recently, it is not unusual for holdout investors to receive a package of securities with face value equal to the cash offer to initially-tendering investors.

(or fixed income securities) payments to shareholders. Then

$$V^I \equiv V^C + P - V_0^B - V_0^T(1 - \alpha). \quad (1)$$

The first two terms on the RHS are the total discounted value of cash flows going to bidder and target shareholders if the takeover occurs. The last two terms subtract the total value if there is no takeover. This is the sum of the values of the bidder and the target less the value of the bidder's stake in the target (which would otherwise be double-counted). If the offer is all equity,  $P = 0$ .

Then the *Strong/Agency Hubris Hypothesis* obtains if and only if the average improvement is zero, i.e.,

$$\bar{V}^I(\theta) = 0,$$

where  $\theta$  is the market's information set.

Some theoretical models predict that in the absence of dilution of minority shareholders, bidders will not on average profit on shares purchased in the offer (Grossman and Hart [1980], Shleifer and Vishny [1986], and Hirshleifer and Titman [1990]). Even if a successful bidder loses money on these shares, he may still profit from the acquisition by increasing the value of the shares accumulated prior to the offer. The prediction that the bidder profits on shares purchased in the tender offer is termed the *Underpayment Hypothesis*, as opposed to the *Overpayment Hypothesis*. The Overpayment (Underpayment) Hypothesis implies that the bid premium on average exceeds (is less than) the value of the target shares to the bidder. Let  $V$  denote this post-takeover value of the target to the bidder, fully reflecting any possible synergistic or other gains from takeover. Then the expected post-takeover value of the target to the bidder,  $\bar{V}$ , is defined by

$$\bar{V} \equiv V^I + V_0^T. \quad (2)$$

The over/underpayment hypotheses can then be expressed as

$$\frac{\bar{B}}{V_0^T} \gtrless \frac{\bar{V}^T}{V_0^T}, \quad (3)$$

where  $\bar{B}$  denotes the expected value of the final bid conditional on the first bidder succeeding.

## C The Probability Scaling Method of Estimating Value Changes

Let  $\theta_0$  be all public information known just prior to the first bid. Let  $\theta_1$  be all public information known just after the first bid. Let  $\theta_2$  refer to information known just prior to the arrival of a competing bid. Let  $\theta_3$  contain in addition the information conveyed by

the competing bid. Let dates  $t = 0, 1, 2, 3$  refer to dates at which  $\theta = \theta_0, \theta_1, \theta_2$  and  $\theta_3$  respectively. Subscripts of 0, 1, 2, and 3 will denote expectations formed conditional on these information sets.

Let  $\bar{B}(\theta)$  be the expected value of the final bid conditional on the first bidder succeeding and on  $\theta$ . Let  $\bar{V}^T(\theta)$  be the expected post-takeover value of the target conditional on the first bidder succeeding and on information set  $\theta$ . Let  $Pr(S|\theta)$  denote the probability of success of the first bidder in acquiring the target given  $\theta$ . Let  $V_0^T$  be the stand-alone value of the target. Let  $Pr(FB \text{ Arrives and Wins})$  be the probability that a first bidder (FB) arrives and wins, let  $\bar{B}_0^F$  be the expected price paid by the first bidder should that bidder wins as assessed prior to the arrival of the first bid, let  $Pr(LB \text{ Arrives and Wins})$  be the probability that a FB arrives, and that a later bidder (LB) arrives subsequently and wins, let  $\bar{B}_0^L$  be the expected price paid by such a winning bidder (assessed at date 0). Adding a 1 subscript to variables instead of a zero will indicate expected values formed after the arrival of the initial bid.

For simplicity, in this analysis we make the approximation that the first bid comes as a great surprise to the market. Thus, the prior expected target payoff is just the stand-alone value  $V_0^T$ , and the prior expected bidder payoff is just the stand-alone value  $V_0^B$ . To calculate the expected target and bidder payoffs after the arrival of the initial bid, we define

$$\begin{aligned} \pi_1^T \equiv & \\ & V_0^T + Pr(FB \text{ Wins}|FB \text{ Arrives})(\bar{B}_1^F - V_0^T) \\ & + Pr(LB \text{ Arrives and Wins}|FB \text{ Arrives})(\bar{B}_1^L - V_0^T). \end{aligned} \quad (4)$$

Let  $V^I$  be the value improvement. Assume that FB has no initial shareholding in the target. Then the expected profits for FB given a first bid are

$$\pi_1^B \equiv V_0^B + Pr(FB \text{ Wins}|FB \text{ Arrives})(V_0^T + V^I - \bar{B}_1). \quad (5)$$

Summing gives the combined expected value of bidder plus target given arrival of a first bid. This is

$$\begin{aligned} & \pi_1^T + \pi_1^B \\ & = V_0^T + V_0^B + Pr(FB \text{ Wins}|FB \text{ Arrives})V^I \\ & + Pr(LB \text{ Arrives and Wins}|FB \text{ Arrives})(\bar{B}_1^L - V_0^T) \end{aligned} \quad (6)$$

Let  $\phi^L \equiv Pr(LB \text{ Arrives and Wins})$ . Then

$$R_1^C \equiv \frac{\pi_1^T + \pi_1^B - V_0^T + V_0^B}{V_0^T + V_0^B} = Pr(FB \text{ Wins}|FB \text{ Arrives})V^I + \phi^L(\bar{B}_1^L - V_0^T), \quad (7)$$

To obtain a simple formula for  $V^I$ , we approximate by assuming that the later bidder's winning bid is fair, i.e.,

$$\bar{B}_1^L = V_0^T + V^I.$$

Then

$$R_1^C = Pr(FB Wins|FB Arrives)V^I + \phi^L V^I, \quad (8)$$

so

$$V^I = \frac{R_1^C}{Pr(FB Wins|FB Arrives) + Pr(LBwins|FBarrives)}. \quad (9)$$

This is the simplest formula for implementing the probability scaling method. We refer to the value improvement  $V^I$  estimated from this PSM formula as the probability adjusted improvement.

## D The Intervention Method of Estimating Value Changes

The first step is to calculate the bidder's abnormal return  $R_t$  between dates 1 and 3 in terms of the expected post-takeover value of the target to the bidder  $\bar{V}^T(\theta_t)$  at these dates.<sup>15</sup> Then (using empirical estimates of unconditional and conditional probabilities of success and expected premia, abnormal returns and other parameters) we will invert the relationship to infer  $\bar{V}^T(\theta_t)$ .

Consider the arrival of the competing bid at date 3. Let the market's assessment of the component of bidder's value not derived from the takeover be  $y$ .  $y$  may not equal the pre-offer value of the bidder as assessed by the market if the initial offer conveyed information about the bidder. We assume that the arrival of a competing bid is uninformative about the stand-alone value of the first bidder, so that  $y$  is the same at dates 1, 2 and 3 (before and after the arrival of the competing bid). Let  $R_3 \equiv (P_3 - P_1)/P_1$  be the date 3 return associated with information  $\theta_3$ , where  $P_1$  is the bidder's stock price just after the initial bid, and  $P_3$  is the price based on  $\theta_3$  after a competing bid arrives. So

$$P_3 = P_1(1 + R_3). \quad (10)$$

Let  $\bar{V}^T(\theta_1)$ ,  $\bar{V}^T(\theta_3)$ ,  $\bar{B}(\theta_1)$  and  $\bar{B}(\theta_3)$  be abbreviated as  $\bar{V}_1$ ,  $\bar{V}_3$ ,  $\bar{B}_1$  and  $\bar{B}_3$  respectively. To relate  $\bar{V}(\theta)$  to the observables  $P_3$  and  $P_1$ , note that

$$\begin{aligned} P_1 &= y + \bar{\pi}_1 \\ P_3 &= y + \bar{\pi}_3, \end{aligned} \quad (11)$$

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<sup>15</sup>For expositional simplicity, the model examines raw returns. For standard reasons, in implementing the model empirically abnormal returns are used.

where  $\bar{\pi}_t$  is the bidder's expected profit from takeover conditional on information  $\theta_t$ . This is

$$\begin{aligned}\bar{\pi}_1 &= Pr(S|\theta_1) \{ \alpha[\bar{V}_1 - V_0^T] + (1 - \alpha)[\bar{V}_1 - \bar{B}_1] \} \\ \bar{\pi}_3 &= Pr(S|\theta_3) \{ \alpha[\bar{V}_3 - V_0^T] + (1 - \alpha)[\bar{V}_3 - \bar{B}_3] \}.\end{aligned}\quad (12)$$

We assume that the arrival of the competing bid at date 3 does not provide any information about the value of the target to the first bidder.<sup>16</sup> Hence,  $\bar{V}_3 = \bar{V}_1 = \bar{V}$ . The robustness of the results with respect to this assumption is analyzed in Section IV.<sup>17</sup> The unobservable  $y$  can be eliminated from (11), and the result combined with (12), giving

$$\bar{V} = \frac{P_3 - P_1}{Pr(S|\theta_3) - Pr(S|\theta_1)} + \alpha V_0^T + \frac{(1 - \alpha)[Pr(S|\theta_3)\bar{B}_3 - Pr(S|\theta_1)\bar{B}_1]}{Pr(S|\theta_3) - Pr(S|\theta_1)}.\quad (13)$$

Dividing both sides of (12) by  $V_0^T$ , gives

$$\frac{\bar{V}}{V_0^T} - 1 = \frac{R_3(P_1/V_0^T)}{Pr(S|\theta_3) - Pr(S|\theta_1)} + \alpha + (1 - \alpha)[\lambda(\bar{B}_1/V_0^T) + (1 - \lambda)(\bar{B}_3/V_0^T)] - 1,\quad (14)$$

where

$$\lambda = \frac{Pr(S|\theta_1)}{Pr(S|\theta_1) - Pr(S|\theta_3)}.$$

In principle, every parameter in (14) can be given an  $i$  superscript to denote the  $i$ 'th takeover contest. However, we begin by developing the method in its most basic form by estimating certain parameters as sample means under the assumption that they are the same across contests. Under this approach, the terms  $\bar{B}_1/V_0^T$  and  $\bar{B}_3/V_0^T$  can be estimated as

$$\frac{1}{n_1} \sum_{i=1}^{n_1} (B^i/(V_0^T)^i) \quad \text{and} \quad \frac{1}{n_3} \sum_{i=1}^{n_3} (B^i/(V_0^T)^i),$$

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<sup>16</sup>This would obtain under the Strong Agency/Hubris Hypotheses, and provides a natural null hypothesis against which to test for takeover improvements. More generally, the arrival of either an initial bid or competing bid could reveal information about target value. However, the evidence regarding the information conveyed by an initial bid is conflicting. Bradley, Desai and Kim (1983) find that average cumulative abnormal returns of targets are approximately zero among targets of failed offers that are not later acquired. This suggests that there may be no permanent informational revaluation associated with the initial bid. Pound (1988) finds that analysts do not revise upward their forecasts of target stand-alone earnings when a takeover bid is announced. However, taking into account systematic biases in analyst forecasts, Brous and Kini (1993) in contrast find that an adjusted measure of target earnings forecasts revisions is on average positive.

<sup>17</sup>This assumption is consistent with private information possessed by the second bidder. This could be information about a private component of its valuation of the target (e.g., a synergy unique to the second bidder). The second bidder can also possess information superior to that of investors about common value components (e.g., gains from remedying target management failure), so long as investors do not perceive the second bidder's information as adding to that of the first bidder.



where  $n_1$  is the number of initial offers, and  $n_3$  the number of contests in which a competing bid occurs. Similarly,  $Pr(S|\theta_1)$  and  $Pr(S|\theta_3)$  can be estimated as the fraction of initial bids that succeed in the overall sample, and in the subsample in which a competing bid occurs, respectively. A more sophisticated approach is to estimate separate transaction-specific probabilities of success using the logit model of Table 4; see Section III.A.1.

The quantities  $R_3, P_1/V_0^T$ , and  $\alpha$  can be calculated directly and are specific to the takeover contest. The value improvement ratio  $(\bar{V} - V_0^T)/V_0^T$  (“*IRATIO*”) is the market’s estimate of the percentage improvement in the combined value of the bidder and target relative to the nontakeover value of the target. Thus, *IRATIO* is greater than 0 if and only if joint bidder/target value is improved, and exceeds 1 by the value improvement as a percentage of target value. While *IRATIO* measures improvements normalized relative to target stand-alone value, the intervention method makes no assumption whatsoever as to whether improvements are specific to changes in the bidder, the target, or involve joint synergies.

The Strong Agency/Hubris Hypothesis implies that this ratio is zero. The Overpayment and Underpayment Hypotheses are tested simply by comparing the average bid premium with the average estimated improvement given in (3).

It is useful to mention some caveats about the use of the value improvement estimates derived here for drawing welfare conclusions. These bear explicit discussion. First, like other stock market studies, the intervention method estimates improvements *as perceived by the market*. If the market is systematically biased, the true improvements will differ from these estimates. Second, we estimate the direct effects of takeover. The *threat* of takeovers can discipline managers, but can also pressure managers into actions that are not in shareholder interest. Third, redistributions to shareholders from bondholders or other stakeholders are included as part of the value improvement. These are not a social gain. Fourth, certain costs of the takeover process are not netted from our value improvement estimates.<sup>18</sup>

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<sup>18</sup>The intervention method measures the value improvement to be derived from a combination at the time of the intervention. The method will net out from the value improvement any cost which will only be realized conditional on the takeover succeeding. (Such a cost will be reflected in the stock return on the date of intervention as a lower value to the bidder of successfully acquiring the target.) However, the intervention method will not deduct costs that are incurred regardless of whether the combination actually occurs. (Such a cost will not be reflected in the intervention-date stock return.) Such costs include ex ante costs of locating a target, or some of the costs of the bidding process. However, given the size of the estimated improvements, we suspect that this consideration alone would not reverse the conclusion of positive gains from takeover.

## II Data

The initial data set was constructed from two sources: The first consists of 559 tender offers that were announced during the period October 1958 through December 1984. “It contains almost every tender offer made in the 1958-1984 period where at least one firm (the target or a bidder) was listed on the NYSE or AMEX...at some time between July 1962 and December 1984.”<sup>19</sup> This study investigates the wealth effects of a tender offer on both bidders and targets. We therefore restricted the sample to the 327 tender offers in which the bidder and target were both listed on the NYSE or AMEX. Additional data-availability and data-consistency requirements reduced the sample size for the 1962-1984 period to 292.<sup>20</sup>

The second data source consists of all tender offers from 1985 to 1997, obtained from the Securities Data Company (SDC) Mergers and Acquisitions database. Excluding self-tenders, repurchases and recapitalizations, this dataset contains 1591 offers. The requirement that target and acquirer both be publicly traded on the NYSE, AMEX or NASDAQ reduced the sample to 543 tender offers. In 8 tender offers, the acquirer made a subsequent tender offer for the target and in these cases only the initial tender offers were included. For both target and acquirer the SDC firm names and CUSIP numbers were manually matched with firms in the CRSP database. For 33 of the tender offers, CRSP data were not available either due to the required time period (e.g. a firm was delisted prior to the tender offer event) or due to failure to match the firm reported by SDC with a firm in the CRSP database. After excluding these 33 offers, the resulting number of tender offers from 1985 to 1997 in our dataset is 502.

To compile a history of the events that occur subsequent to a tender offer that might affect the probability of success of the bid, we manually searched the *Wall Street Journal Index* for the 292 target firms during 1962-1984, and used the online service *Dow Jones Interactive* to search the *WSJ* for information on the 502 target firms during 1985-1997, for a total of 794. We searched for information on the following:

1. Litigation by the target firm or its shareholders.
2. Litigation by the bidding firm or its shareholders.
3. Second and third bidders.

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<sup>19</sup>The quotation is from the write-up for the dataset compiled by Michael Bradley, Robert Comment, Anand Desai, Peter Dodd, and Richard Ruback. We thank these authors for providing us with their data.

<sup>20</sup>12 tender offers were announced prior to July 1962. The Daily CRSP tape does not contain returns prior to this date. Our verification of tender offer announcements and name changes led to some minor changes in the database.

4. Objection raised by a regulatory agency (e.g., FTC, Department of Justice).

Table 1 records the frequency of the 794 attempted takeovers during 1962-1997; see also Figure 1. Using the criterion of success considered by BDK-88 - the bidder acquires at least one share in the tender offer - 530 or 67% of these offers are successful. 203 of these 794 offers were considered hostile by the target management. A second bidder entered the contest in 138 of these 794 tender offers. Target management litigated in 160 cases. Finally, 572 of these 794 offers were all-cash offers.

Figure 2 describes the percentage of successful and unsuccessful offers, the percentage of takeovers that had at least two bidders, the percentage takeovers considered hostile by target management, and the percentage of all cash offers during different periods.<sup>21</sup>

### Returns to Bidders and Targets

Table 2 summarizes the returns to bidder and target shareholders (where both companies were listed on NYSE, AMEX, or NASDAQ) during 1962-1997. During this 36-year period, the average return to bidding shareholders has been a statistically insignificant 0.26%. The bidder median dollar return is an economically insignificant -\$0.88 million. During this same 36-year period, the target shareholders enjoyed a statistically and economically significant average return of 28.5% and median dollar return of \$20.2 million.

Since the extant literature suggests that target returns dissipate for unsuccessful takeover bids (Bradley, Desai and Kim (1983)), we also consider returns to bidders and targets in only successful takeovers. We use the criterion of success considered by BDK-88 - the bidder acquires at least one share in the tender offer. In successful takeovers, bidding shareholders receive an average return of 0.65%; however, in more than half of such takeovers the bidding shareholders experience a wealth loss! The median dollar return to bidders in successful takeovers is -\$1.0 million.

It is also instructive to consider returns to targets and bidders over various sub-periods in Table 2 and Figures 3 through 7. The first three sub-periods are as in Bradley, Desai and Kim (1988); July 1962 through June 1968 is the pre-Williams Act period, July 1968 through December 1980 is the post-Williams Act but pre-Reagan period. 1981-1984 was the final period considered by Bradley, Desai and Kim (1988). The four-year sub-periods 1985-1988, 1989-1992, and 1993-1996 correspond roughly to the presidential political cycles. Also, the 1981-1988 period was a highly active takeover market, aided perhaps by pro-merger policies of the Reagan administration. Some commentators have argued that the late-80s and early-90s, corresponding to out 1989-92 sub-period, were a time when deals were not economically

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<sup>21</sup>The lack of cash offers during 1981-84 is interesting. Other than noting the relatively fewer tender offers during this period of economic recession (see Figure 1), we have no explanation for this.

attractive, but were being done for the sake of "doing the deal." The most recent 1993-1996, and 1997 sub-periods have not been examined before in the literature.

Our results for bidder returns, target returns, and a value-weighted average for bidders and targets (the "combined" return), for the first three sub-periods (July 1962 - June 1968, July 1968 - December 1980, 1981-1984) are consistent with the findings of Bradley, Desai and Kim (1988). We define the dollar return for the target as its market value six days before the first bid multiplied by the target CAR; similarly for the bidder and combined dollar returns. During 1985-1988, the bidding shareholders earn a statistically insignificant mean return of -.15% (median return of -\$2.80 million). During this same 1985-1988 period, the target shareholders received a statistically and economically significant return of 31.9% (median return of \$21.4 million).

As suggested earlier, the late-80s and early-90s (1989-1992) were not kind to bidders: mean return of -2.13% (median return of -\$17.7 million). Bidding shareholders have generally fared better in the 1993-1996, and 1997 sub-periods: mean returns of 1.32% and 1.75%, respectively (median returns of \$4.40 million and -\$2.91 million, respectively). The mean combined returns during 1993-1996 and 1997 were 5.11% and 7.08%, respectively (median return of \$48 million and \$42 million, respectively).

One objective of this study is to measure the effect of takeovers on the wealth of bidder shareholders, while avoiding the revelation bias inherent in bidder's returns on the announcement of the offer or of its completion. As discussed earlier, we address the revelation bias in bidder stock returns emphasized by several authors by considering interventions that change the probability that the first bidder will be successful, but are not at the discretion of the first bidder. Litigation by the target, entry of a second bidder, and objection by a regulatory agency are examples of such exogenous events. In principle, one could use any such event (or several events) in empirical tests. Our main analysis focuses on the entry of a second bidder. We begin with an examination of the effects of various interventions in order to document that the entry of a competing bidder is an important event for the initial bidder.

To estimate how the market's perception of probability of success is affected by the arrival of a competing bid, we need estimates of the market's perception of probability of success both prior to the competing bid (an 'unconditional' estimate), and subsequent to the bid (a 'conditional' estimate). We therefore estimate both a logit model that conditions only on information known to the market prior to the arrival of the competing bid, and on a logit model which in addition conditions on the arrival of the bid.

Table 4 provides estimates of such a model. The dependent variable equals one if the first bidder is successful and zero otherwise. Litigation = 1 if the target files a lawsuit

against the first bidder and zero otherwise. Competing bid = 1 if a second bidder enters the bidding contest and zero otherwise. Hostile = 1 if target management verbally opposes the first bid, and zero otherwise.  $\alpha$  is the fraction of the target's shares held by the first bidder at the date of the initial offer. Premium is the premium offered by the first bidder using the target's price one month prior to the bid as the baseline.<sup>22</sup>

Model A does not condition on whether a competing bid has occurred; model B does. Model A1 conditions on whether there was litigation associated with the bid, and Model A2 does not. For a short window that begins just before a competing bid, the market is likely by this time to have observed the occurrence of litigation related to the initial bid if such litigation was going to occur. At the start of a longer window that begins immediately after the arrival of the initial bid, at this moment in time the market is unlikely to observe the occurrence of litigation even if it will occur. Thus, for the short window Model A1 is appropriate, and for the longer window Model A2 is appropriate.

The results indicate that target management opposition, entry of a second bidder and the premium offered are determinants of bidder success (opposition and competition having negative effects), and, with somewhat lower significance, target litigation and the fraction of target held by the first bidder.<sup>23</sup>

Having established the arrival of a competing bid, and to some extent the occurrence of litigation, as important events for the success of an offer, we consider bidder abnormal returns around the announcement of a competing bid. The abnormal returns are computed using the market model as the benchmark.<sup>24</sup> During a two-day period consisting of the day of the publication of the news of the second bid in the *WSJ* and the day before, the mean abnormal return for the first bidder is -.3%, (z-stat = -.82) (median/min/max are -.3%/-10.4%/12.6%). The mean return for the period from one day after the publication of the news of the first bid in the *WSJ* to the day of the publication of the news of the second bid; this return is -3.0% (z-stat=-2.78) (median/min/max are -2.1%/-99.8%/40.3%).

Even though the arrival of a competing bid is a major event, the two-day mean abnormal return on this date is close to zero. The event-date return reflects two potentially offsetting effects. The higher average premium a winning first bidder will have to pay given a competing bid is bad news, but the reduced probability of success resulting from a competing bid can be good news if the market expects a successful bidder to overpay.

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<sup>22</sup>Walking (1985) found some of these variables to be significant determinants of tender offer success.

<sup>23</sup>Target opposition is a matter of degree, whereas the arrival of a competing offer is a discrete event. Thus, the latter seems a more appropriate focus for investigation.

<sup>24</sup>For the short return cumulation window used here, the choice of benchmark is unlikely to affect results materially. The market model is estimated using returns from day -170 through day -21 where day 0 is the announcement of the first bid in the *WSJ*. The equally weighted CRSP index is used as the market index.

### III Estimates of Value Improvements

#### A Value Gains: The Intervention Method

##### A.1 Basic Estimates

As discussed in Section I,  $(\bar{V}_1/V_0^T) - 1$  (“*IRATIO*”) provides the market’s estimate of the value to a bidder of a takeover target, i.e., the joint value improvement brought about by the takeovers. If the bidder is unable to improve the value of the target, then the Strong Agency/Hubris Hypothesis obtains, and this ratio is zero. If the bidder is able to improve value, then this ratio is positive. *IRATIO* is estimated based on equation (14).

If the market is efficient, and if no news about a competing bid arrives until the day that the bid occurs, then the abnormal return expected from date 1 (immediately after the initial bid) through date 2 (just before the competing bid) will on average be zero. Thus, equation (14), which gives  $\bar{V}_1/V_0^T$  in terms of  $R_3$ , the return from date 1 through date 3, also applies with a return from date 2 through date 3, or by choosing some starting date between date 1 and date 2.

There is a tradeoff in using different periods. If news about a competing bid sometimes arrives between date 1 and 2, calculating the return based on the earlier starting point has the advantage of including the effects of such anticipation of the event. However, calculating the abnormal return over a longer period has the disadvantage of introducing noise arising from normal stock price fluctuations and from benchmark estimation errors.

We therefore estimate the return to be substituted for  $R_3$  in (14) based on the two different periods discussed earlier: the two-day event period of -.3% and the period from immediately after announcement of the initial bid through announcement of the second bid, -3.0%.

- $P_1/V_0^T$  in equation (14) is the relative size of the bidder versus the target. The mean (median) figure is 4.68 (1.80).
- $Pr(S|\theta_1)$  is the probability of success of the first bidder in the full sample. In the full sample of 794 cases the first bidder is successful in 530 instances. Hence,  $Pr(S|\theta_1)$  is estimated as .6675.
- $Pr(S|\theta_3)$  is the probability of success of the first bidder given the arrival of a competing bidder. In our sample, there are 137 cases in which a competing bidder arrives; the first bidder is successful in 35 instances. Hence  $Pr(S|\theta_3)$  is estimated as  $35/137 = .2555$ .

- $\alpha$  is the fraction of the target's equity owned by the first bidder. For the 129 tender offers used to construct Table 3, the mean (median)  $\alpha$  is .025 (.000).
- $\bar{B}_1/V_0^T$  is the average price (relative to the target's pre-offer price) at which the first bidder wins in the full sample. The mean (median) for this is 1.435 (1.384).
- $\bar{B}_3/V_0^T$  is the average price at which the first bidder wins given the arrival of a competing bidder. The mean (median) for this is 1.440 (1.421).

### Properties of the Distribution of Estimated Value Improvements

In Table 3, market-based estimates of the expected value improvement from takeover (relative to target stand-alone value) are labeled *IRATIO*, and calculated as in equation (14) using estimated parameters  $Pr(S|\theta_1)$ ,  $Pr(S|\theta_3)$ ,  $\bar{B}_1/V_0^T$ , and  $\bar{B}_3/V_0^T$ . In the first row, the average *IRATIO* is 50.6%, indicating that the target is 50.6% more valuable to the bidder than the target's pre-offer value. This evidence is inconsistent with the Strong Agency/Hubris Hypothesis of zero value improvements in tender offers. Since 123 of 129 *IRATIO*s are greater than zero, the conclusion that the expected value improvement is significantly greater than zero seems highly robust.<sup>25</sup> A histogram of *IRATIO* is provided in Figure 1. In the second row of Table 3, the mean and median *IRATIO* estimates using a longer event window (from the day after the announcement of the initial bid through the day of announcement of the second bid) are again positive and statistically and economically significant.<sup>26</sup>

In a large sample of takeovers, it is to be expected that a few extreme cases will involve very large creation or destruction of value. The minimum and maximum *IRATIO*s are large, but not unreasonable. For example, in Row 1 of Table 3, the minimum *IRATIO* of -256.7% indicates that the acquisition destroys an amount of value more than twice the value of the target, and the maximum *IRATIO* indicates creation of value almost 8 times as large as target value. However, in some cases unrelated news events about firms arrive on the date of bid announcement, by chance or otherwise. The arrival of independent news introduces noise in *IRATIO*s which, in extreme cases, can be large.

The next subsection A analyzes the robustness of the conclusion that value improvements are on average positive with respect to misestimation of the input parameters. A

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<sup>25</sup>A sign test yields  $p < .000$ .

<sup>26</sup>It may seem surprising that *IRATIO* estimates are so similar for the two windows, given that the long window generates mean returns that are much smaller than the short window mean returns (-3.0% rather than -0.3%). However, based on formula (14) for the *IRATIO*, the negative contribution of a low return to mean *IRATIO* is moderated if the bidder/target market value ratio  $P_1/V_0^T$  is low. So if market anticipation of (typically negative) returns is greater among large targets, the mean return can be more negative in the long window yet the estimated *IRATIO* need not be larger.

previous version of the paper developed a parametric derivation (available on request) of the distribution of the test statistic, the mean *IRATIO*, under the null hypothesis that the true value improvement is zero and given random sampling error in our estimates of  $Pr(S|\theta_1)$ ,  $Pr(S|\theta_3)$ ,  $\bar{B}_1/V_0^T$ , and  $\bar{B}_3/V_0^T$ . Using this model, the null hypothesis is again strongly rejected ( $p < .001$ ).

Our estimate of value improvements in Table 3, the first row, uses as inputs parameter estimates of the probability of success of the first bidder  $Pr(S|\theta_1)$ ,  $Pr(S|\theta_3)$ . These probabilities are estimated as the fraction of first bidders that succeed in the full sample, and in the subsample in which a competing bid occurs. The respective parameter estimates of .6675 and .2555 are therefore not transaction specific; they are used for each of the 129 competing bid observations to estimate value improvements.

An alternative approach is to estimate separate transaction-specific probabilities of success using the logit model of Table 4 to obtain different probability estimates for each of the 129 transactions. Similarly, instead of assuming that the expected bid premium that will be paid (relative to pre-offer price) in the event that the first bidder succeeds is independent of the transaction, we estimate regression models relating the price paid in successful transactions to the same independent variables used in Logit Models A1, A2, and B. This generates a corresponding set of regression models. When these estimates are applied (Table 3), the mean (median) value improvement for the shorter window is 49.9% (48.4%), which is quite similar to the estimates obtained using the basic approach. These results are consistent with the conclusion that value improvements on average differ from zero and are generally positive.

## Do Bidders Pay Too Much?

Since the mean *IRATIO* is not statistically different from the mean premium paid in these multiple bidder offers, we cannot reliably reject the null that the payment is on average fair. A similar conclusion applies for value improvements estimated by *PSM*; see the probability adjusted measure *PA2CIBR* in Table 5. In the multiple bidder sample, the *IRATIO* estimates indicate that 64 of the 124 successful initial bidders overpaid. However, since value improvements are large, it appears that most of the average successful premium



can be explained by value improvement.<sup>27</sup>

### Time Variation in Value Improvements

Evidence on value improvements in different categories of transactions is summarized in Table 6. The Williams Act of 1968 and associated legislation requiring disclosure and delaying completion of tender offers makes it easier for competitors to investigate after an initial bid (see Jarrell and Bradley [1980]). One would expect this to narrow the set of bidders willing to make an initial offer to those with higher valuations. In our sample, the mean value improvement in the post-Williams Amendment era was 50.4% (median 43.2%), which is fairly similar to the pre-Williams Amendment estimates of 52.3% (median 55.5%). Of course, there were many other important differences between the early and later periods. We have not yet performed this comparison for the *PSM* measure.

### Friendly versus Hostile Offers

Past commentators have proposed two very different economic roles for takeovers—discipline or removal of bad target managers, and exploitation of business synergies. The mean (median) estimated value improvement of 32.8% (41.2%) among transactions opposed by target management are significantly smaller than the figures for unopposed transactions, 74.7% (50.4%). Thus, takeovers seem to improve value in both friendly and hostile transactions.

How this evidence is interpreted depends on the conceptual benchmark for a ‘normal’ value improvement. Although the value improvement is greater for friendly takeovers when taken as a fraction of target value, there is little difference in estimated value improvements measured as a percentage of combined bidder-target value.

Overall, this evidence indicates (1) that both roles for takeover are important, and (2) that exploitation of business synergies may be a more important source of value creation in multiple bidder takeovers than correcting managerial failure. Alternatively, the market may believe that targets of hostile takeovers are likely to engage in ‘scorched earth’ tactics

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<sup>27</sup>This conclusion should be qualified by a possible sample selection bias. The intervention method examines initial bidder returns when a competing bidder enters, but if the initial bidder offers too much on his first bid, this will tend to discourage competitors from arriving. Thus, a bidder who offers a very generous initial offer may not end up in the multiple-bidder sample. On the other hand, other things equal, the arrival of a competitor raises the amount that a first bidder with given valuation will have to pay. Thus, we doubt that there is more overpayment in single-bidder contests than in multiple bidder contests. This view is consistent with evidence on competitors’ stock returns (see BDK-88).

that reduce potential value improvements.

### Relative Market Values of Bidder and Target

Table 8 (*IRATIO*) indicates that acquisitions by a large bidder of a small target improve value as a fraction of target market value more than combinations of similar-sized firms. This is consistent with the idea that cultural clashes and leadership problems are more severe in ‘mergers of equals.’ (See, e.g., *The Economist*, 1/9/99, page 15: “Nor does it [success] require similarity of size: mergers of equals seem to be especially tricky, perhaps because they disrupt two strong corporate cultures, and they often throw up intractable problems of leadership.”) Alternatively, it may be that when a large firm acquires a small target it does so because the business benefits of possessing the target can be ‘leveraged’ at least to some extent across the larger firm.

Of course, this pattern does not show up for value improvements as a fraction of combined bidder/target value (*PIRATIO* in Table 8). This is a mechanical consequence of the denominator; when an elephant swallows a flea, there is little perceptible change in the elephant.

Interestingly, the result on relative size is not as clearcut when initial bid stock returns are used (*CIBR* in Table 8). The amount of revelation effect resulting from the bid may differ for large versus small bidders, which would tend to have confounding effects on the relation between mean returns and relative size. The greater clarity of the result with *IRATIO* may result from the success of the intervention method in filtering out such extraneous revelation effects.

### Focusing versus Diversifying Transactions

Table 9 describes the returns and *IRATIO*s associated with cross-industry versus same-industry transactions. Using conventional weighted average combined returns, the evidence tends to suggest that same industry acquisitions lead to higher value improvements than do cross-industry returns, especially when industry is defined by 3-digit rather than 4-digit SIC codes (Panel A). This is consistent with the findings of Morck, Shleifer and Vishny (1990) using an earlier dataset. Interestingly, in the competing bid subsample, this effect vanishes, measuring either with combined returns or *IRATIO*. It is not obvious why this is the case. It will be interesting to extend the full sample calculation to probability adjusted returns.

## A.2 Sensitivity Analysis

In this subsection we analyze the robustness of estimated value improvements with respect to parameter estimates for  $\bar{R}_3$ ,  $Pr(S|\theta_1)$ ,  $Pr(S|\theta_3)$ ,  $\bar{B}_1/V_0^T$ , and  $\bar{B}_3/V_0^T$ . To determine the

robustness of our conclusions with respect to these parameters, we conduct two further experiments. First is a sensitivity analysis of *IRATIO* with respect to the probability of success unconditionally,  $Pr(S|\theta_1)$ , and conditional on a competing bid,  $Pr(S|\theta_3)$ ; with respect to the expected price paid unconditionally,  $\bar{B}_1/V_0^T$ , and conditional on a competing bid,  $\bar{B}_3/V_0^T$ ; and with respect to the mean first bidder stock return on announcement of a competing bid,  $\bar{R}_3$ . Second, we compare our results to those implied by samples studied by Bhagat, Shleifer, and Vishny (1990) (BSV), and Betton and Eckbo (1998).

As a check of the robustness of our conclusion that the mean improvement ratio is positive, we examined the effect of shifting each of these estimated parameters *simultaneously* in the direction of lower *IRATIO*. This check is stringent, since there is no reason to expect estimation errors all to boost the *IRATIO*. The results indicate that the conclusion that value improvements are on average positive is not very sensitive to shifts in parameter estimates. Even if all 4 of the estimated parameters are shifted by 12% of their respective mean values, the mean estimated *IRATIO* remains positive.<sup>28</sup>

A limitation of the intervention method is that it provides value estimates only in those contests for which the intervention (competing bid) actually occurs. It is possible that contests that did not enter the intervention sample are different, so that the returns to the first bidder in such contests if a competing bidder had arrived would be systematically different from the first bidder returns in the actual sample. While it is impossible to address this issue conclusively, it is interesting to observe the extreme robustness of the conclusion of positive value improvements with respect to the estimated stock returns. The sensitivity to  $\bar{R}_3$  provides an indication of whether the conclusions we derive are likely to be sample specific. We recalculated *IRATIO*s substituting fictional alternative values for  $\bar{R}_3$  for all first bidders. Both the mean and median value improvements remain positive even for an abnormal return as high as +5%, and a majority are positive even for an abnormal return as high as +7%.<sup>29</sup> These sensitivity analyses support the conclusion that value improvements are on average positive and substantial.

It is also interesting to see whether the conclusion of positive average value improvements applies in different samples. BSV analyze an exhaustive sample of hostile takeover contests in the U.S. during 1984 through 1986 where the purchase price was \$50 million or more.

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<sup>28</sup>The probability that all 4 misestimates are in the upward direction is  $(1/2)^4 = 1/16$ ; imposing the condition that the magnitudes of the misestimates be greater than 12% would reduce the probability much further.

<sup>29</sup>Intuitively, the reason that the estimates remain positive even when intervention returns are high is that the mean bid premia are very substantial. Thus, even if the value improvement is positive, if it is smaller than the expected price to be paid, the arrival of a competing bid and the associated reduction in the probability of the first bidder succeeding can be good news.

Their sample consists of 61 contests: 50 targets were acquired and 11 remained independent. The first bidder was successful in 29 of the 61 contests. Competing bids were observed in 30 of the 61 contests. The first bidder prevailed in the face of a competing offer in nine instances.

The above figures indicate that in the BSV sample  $Pr(S|\theta_1)$ , the probability of success of the first bidder in the full sample, is 29/61 or .4754. Also,  $Pr(S|\theta_3)$ , the probability of success of the first bidder in the presence of a competing bidder, is 9/30 or .3000. Similarly, Table 3 provides the estimates of  $\bar{B}_1/V_0^T$ , and  $\bar{B}_3/V_0^T$  implied by the BSV sample. We then substitute these parameter estimates into the IRATIO formula transaction by transaction in our full dataset to generate an alternative set of IRATIO's. Table 3 compares the resulting *IRATIO* estimates resulting from these parameter inputs with the results based on our own input parameter estimates.

The estimated input parameters from the BSV sample period (1984-6) are quite similar to those of this study. When the BSV sample parameter estimates are substituted into the *IRATIO* formula (14), the inference about *IRATIO* (the ratio of the post-takeover value of the target to the pre-takeover target value) is unchanged, that the mean *IRATIO* is positive. Simultaneously substituting the BSV estimates for  $\bar{B}_1/V_0^T$ ,  $\bar{B}_3/V_0^T$ ,  $Pr(S|\theta_1)$ , and  $Pr(S|\theta_3)$  with other mean parameters generates a mean (median) *IRATIO* of 39.2 (21.5).

Thus, the estimates of value improvements from the BSV study are substantial and positive, but not as large as in our overall sample. This is consistent with the finding in our sample that the mean *IRATIO* is lower for hostile offers than for friendly offers (see Subsection A.1).

Betton and Eckbo (1998) examine a sample of tender offers from 1971-1990. They report that in their sample, the unconditional probability of bidder success was .6386, and conditional on a competing bid was only .1682. The unconditional expected premium was 56.96%, and conditional on a competing bid was 85.60%. Applying these figures to our overall sample transaction by transaction in the *IRATIO* formula gives an average *IRATIO* of 45.6% (52.2%).

To summarize, in this subsection we have performed sensitivity analyses by varying estimated parameters, both individually and simultaneously; and by using parameter estimates obtained from the BSV and the Betton and Eckbo (1998) samples. These analyses all confirm that value improvements were on average positive.

## B The Bidder's Initial Shareholding in the Target

Bidders often own a significant fraction of the target's equity prior to making the bid. BDK-88 report mean ownership of 9.8% (median 0%) of the target by the bidder in 236 successful tender offers during 1963-84. Shleifer and Vishny (1986) have suggested that increase in the underlying value of the bidder's initial foothold provides a potential motive for acquisition, despite the free-rider problem of Grossman and Hart (1980). This section analyzes of the extent to which changes in bidders' wealths can be explained by increased underlying value of their initial footholds.

Table 7 describes fractional ownership of target firms by bidders during 1962-97. When the sample is restricted to tender offers in which both the target and bidder were listed on NYSE and AMEX or NASDAQ, the mean bidder ownership is 7.23%, the median is 0%, and only 201 of the 794 bidders own any shares in the target at the time they make the bid. Among the 201 firms that owned at least one share of the target at the time of the bid, the mean ownership is 27.73% and the median is 14.52%. It appears that conditional on a bidder owning a positive fraction of the target at the time of the bid, its initial holding is substantial.

Table 7 shows that the mean (median) change in the event of takeover in the underlying value of the initial shareholding held by the initial bidder in the event of successful takeover (calculated based on initial bid stock returns) is \$4.02 million (\$0.00 million).<sup>30</sup> This compares with McLaughlin's (1990) estimate of average investment banker advisory fees paid by bidders of \$2.7 million in a 1978-85 sample of 195 tender offer bidders during 1978-85.<sup>31</sup> Thus, increase in the value of the initial holdings seems to provide a fairly weak motive for takeover. However, the estimates of initial shareholding profits would, of course, increase if measured using the larger *IM* or *PSM* measures of value improvement.

In percentage terms, the change in market value of initial holdings in the event of takeovers is on average 7.23% of target value (median 0.00%). This suggests that many tender offer bidders are not primarily motivated by the possibility of increase in value of their initial holding. However, after excluding contests with zero initial holdings, the mean (median) improvement is more substantial: 27.73% (14.52%) of target value.

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<sup>30</sup>When the sample is restricted to cases where the bidder owns at least one share of the target, the mean (median) change in the underlying value of the initial shareholding is \$15.76 million (\$2.34 million).

<sup>31</sup>This figure does not include financing, underwriting, legal, and accounting expenses, as well as the opportunity cost of managers' time. This average includes unsuccessful offers, so it is an underestimate of the fees that must be paid in order for the first bidder to realize value improvements.

## C A Comparison of *IM*, *PSM* and Traditional Methods

It is interesting to compare the value improvements derived by the intervention method and the probability scaling method with the traditional approach, which consists of examining a weighted average of bidder and target returns. In a subsequent version of the paper the analyses of the previous subsection of whether bidders pay too much, time variation in value improvements, friendly versus hostile bids, relative market values of bidders versus targets, and whether the offer is focusing or diversifying will be extended to compare *IM* with *PSM* and traditional methods.

It is not entirely clear what length of event window to use for the comparison, since the degree of anticipation of the event may differ for an initial bid versus a second bid. Using a day -5 to +5 window where date 0 is the date of the initial bid, the mean (median) weighted average of the bidder and target returns using value weights is 5.90% (4.12%), with 71% of the returns being positive. In the older sample of BDK-88, the mean initial return relative to combined market value (not just target value) is 7.4%. Thus, our study indicates a decline in mean returns in the decade following the BDK study.

Using *IM*, the mean value improvement for the overall period (relative to combined market value) is considerably larger, 16.2%. Since *IRATIO* was defined as the improvement as a percentage of target market value, for comparison we can normalize traditional initial returns by target value in the denominator (instead of bidder + target value). This value, which can be called *CIBR* (combined initial bid returns), is defined as

$$\text{target return} + \text{bidder return} \left( \frac{\text{bidder market value}}{\text{target market value}} \right).$$

This yields a mean (median) market value change as a percentage of target value of 29.3% (25.0%). Thus, the initial bid returns method (normalized by target-value) also yields the conclusion of significant and substantial value improvements.

The long window mean combined cumulative abnormal return (i.e., relative to combined bidder/target value) from -30 through resolution of successful offer is 3.81% (median 7.19%). This is consistent with positive mean value improvements. However, the large difference between mean and median highlights the questionable nature of long window measures of value improvements.

The similarity in mean value improvements using *IM* and *PSM* (50.6%) versus 50.4% indicates that the average revelation bias is close to zero. However, recall that our *PSM* estimates are based on a window beginning only at day -5. A more reasonable starting point that would account for pre-public-announcement anticipation of the event would on the order of 30 to 40 days; see, e.g., Figure 1 of Schwert (1996). Use of such a window (to be

developed in the next revision of this paper) is likely to increase the *PSM* measure, so it is possible that a better estimate will imply a positive average revelation effect. In any case, it will be of interest to estimate the revelation effect in the different categories of transactions to see whether, e.g., use of equity as a means of payment is associated with a more negative or less positive revelation than other transactions.

An examination of the scatter plot between traditional *CIBR* and *IRATIO* in Figure 3 shows that use of the intervention method changes the interpretation of particular transactions substantially. There are transactions in which combined initial returns are positive yet value improvements are estimated to be negative, and transactions in which combined initial returns are negative yet value improvements are positive.

Thus, the intervention method suggests that the value improvements from takeover are much greater than what is suggested using combined initial bid returns. The measured initial return date effect is likely to be larger if a longer pre-event date window were used. However, the start date for the initial bid window of date -5 is already longer than the (-1,0) window used for the arrival of the competing bid. A longer pre-competing-bid window is associated with a higher *IRATIO* estimate as well (see Table 3).

These estimates of value improvement are considerably higher than those obtained from returns associated with initial bid announcement. The combined CARs for these initial returns for different windows are summarized in Table 2, Panel C. Even with long event windows prior to the event, the mean CAR based on the initial bid is *at most* only 7.5%, as compared with 16.2% using the intervention method.<sup>32</sup> These results imply that the gains from takeover are considerably greater than the (already substantial) gains estimated in previous studies.

## IV Robustness with Respect to Model Specification

The intervention method of estimating takeover improvements alleviates the dilemma of window length and the bidder-revelation bias present in previous studies. To the extent that the model is mis-specified it will address these problems imperfectly. In this respect it is similar to past studies. However, in conventional approaches the implicit model is very strong (conclusive resolution of uncertainty about completion soon after the initial offer, and zero revelation effects). The advantage of making the model explicit is that it suggests

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<sup>32</sup>The use of a long window such as 60 or 90 days is probably suboptimal. While such a window ensures that any pre-event information leakage is captured in the return, it also greatly increases noise. In this case, as we lengthen the window the mean CAR increases up to a 30 day window. But moving from a 15 to a 30 day window leads to a *smaller* fraction of positive abnormal returns, suggesting that the problem of noise starts to become severe in the longer window.

possible directions for improving specification and permits quantification of alternatives. To illustrate this point we explore numerically the robustness of the conclusion that average value improvements are positive with respect to four modelling variations. Details of the analyses are relegated to Appendix B.

## 1. Competing Bidder Information

As mentioned in Section III, the arrival of a competing bid may convey information about the either the stand-alone value of the target or its value to the initial bidder. Footnotes 16 and 17 argue that the importance of this effect may be limited. In any case, the intervention method *mitigates* this problem relative to previous studies by focusing on competing bids, since it is likely that much of the private information possessed by bidders about targets will already be conveyed by the initial offer.

If the arrival of a competing bid causes an upward revision in the assessed valuation of the first bidder, then *ceteris paribus* the first bidder's abnormal return  $R_3$  should be higher. By constraining  $\bar{V}_3 = \bar{V}_1$ , our estimates would tend to attribute any such higher abnormal return to the reduced probability of the initial bidder succeeding. Thus, the estimated value improvement would be biased downwards, providing a conservative estimate. Thus, the conclusion that takeovers are on average associated with positive value improvements is strengthened by this consideration.<sup>33</sup> The simulation in Appendix B supports the conclusion that value improvements are on average positive.

## 2. Valuation/Success Correlation

It is likely that success of the initial bidder is positively correlated with the value improvement, because a high valuation first bidder will probably be willing to offer more. The logit-based probability estimates, which generated similar results to simple estimates based on ex post sample fractions, largely addresses this issue because independent logit variables such as the initial bid premium are likely to be proxies for the first bidder's valuation. Even apart from this, the potential bias is a subtle one, because estimates are based on the *change* in probability of success when a competing bid occurs. Even if probabilities were misestimated across transactions, it is not clear that there would be any important misestimation in the changes in probabilities.<sup>34</sup> Similarly, it can plausibly be argued that if improvements

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<sup>33</sup>A special case of this would occur if the arrival of a competing bid was taken by shareholders as an indication that the first bid was due to an actual value improvement rather than hubris. Again, this reinforces the conservatism of our estimates.

<sup>34</sup>A plausible presumption may be that the arrival of a competitor has a smaller impact on probability of success when the valuation is high. Then for a high valuation first bidder, the drop in probability of success is overestimated, which implies that *IRATIO* is an underestimate. (Because the negative abnormal return is attributed excessively to the drop in probability of success rather than to a large value improvement.)



are common across bidders, a high value improvement increases the probability of a competing bid arrives. Again, the potential bias implied by this effect is subtle, because the *ex ante* probability of a competing bid is overestimated for some contests and underestimated for others.<sup>35</sup> We therefore believe that it is unlikely that these effects would have much effect on the conclusions of this paper.

### 3. Future Acquisitions

The analysis has assumed that success or failure of the offer has no effect on any future acquisitions that the bidder may make. More generally, if the first bidder fails to acquire the target, there is a probability that he will thereafter successfully acquire a similar target at a price similar to what he would have paid if he had been successful in acquiring the original target. If so, the stock price reaction to failure of the initial bid will be muted. Of course, a bidder whose offer fails is not certain to make an additional acquisition as a consequence of failure.<sup>36</sup> We model this possible dependence by allowing for some probability that failure of the offer will cause the bidder to try to acquire another comparable target at the same expected price.<sup>37</sup> Suppose that value improvements in takeovers are positive. Then when the arrival of a competing bid reduces the probability of success, the bidder actually has a good chance of succeeding in another acquisition, so the actual bidder return will be greater than that implied by the basic model of Section III. This higher return implies that *IRATIO* will underestimate the actual improvement. Similarly, if value improvements are negative, *IRATIO* will overestimate the improvement. So long as failure may lead to another comparable acquisition, the basic method biases *IRATIO* toward zero, but leaves its sign unchanged.<sup>38</sup> A sensitivity analysis is provided in Appendix B by reestimating *IRATIO*'s in

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Conversely, for low (but positive) valuation firms, the drop in probability of success is underestimated, so that *IRATIO* is an overestimate. Under these conditions this potential bias changes the relative magnitude of *IRATIO* for different firms, but it does not imply any obvious bias in overall sample averages.

<sup>35</sup>If the true improvement is high, the arrival of a competing bid would be less of a surprise than our calculations indicate. For such contests, the improvement is underestimated. On the other hand, if the true improvement is low, the arrival of a competing bid would be more of a surprise than our calculations indicate. For such contests, the improvement is overestimated. The effect on overall sample averages is unclear.

<sup>36</sup>There is no difficulty if the bidder intends to make other acquisitions regardless of the outcome of the first contest. The calculation of the stock price reaction associated with the arrival of a competing bid needs modification only if future acquisitions depend on the success or failure in the current contest.

<sup>37</sup>There are several possible reasons why this probability is less than one. First, alternative targets may seem less attractive to bidding management. For example, under Roll's hubris hypothesis, a bidder's first offer will be to the target he overvalues the most. Second, a manager may change his mind about the desirability of acquisition. Third, he may retire or be replaced before he locates another target. Fourth, if acquisition is undesirable, the initial offer may rouse large shareholders or the board to oppose further attempts. Fifth, the quality of a later acquisition may be imperfectly correlated with that of the initial attempt.

<sup>38</sup>More generally, the sign could be incorrect, but this requires a rather special scenario. For example, if

a model in which, given failure, there is a probability  $\gamma$  that the bidder will make another acquisition attempt of equal quality to the first. As shown in columns 3 and 4 of Table 10 (Table under revision), the estimated value improvement is still positive and substantial for plausible values of  $\gamma$ .

#### 4. Sale of Shares to Another Bidder

Finally, an unsuccessful initial bidder can sometimes profit by selling his holdings to a successful competing bidder (see Appendix). We explore the value improvements for different possible probabilities of success of the second bidder and sizes of initial shareholdings. The estimated value improvement is insensitive to the possibility that a competing bidder buys the initial bidder's foothold.

In summary, several sensitivity analyses with respect to several possible modelling variants confirm that the conclusion of positive average value improvements provided using the basic model is highly robust. For plausible parameter values, all estimates of the average value improvement are positive and substantial.

## V Summary and Conclusions

Different stock market and accounting studies have drawn very different conclusions about whether takeovers on average increase or decrease fundamental value. While existing stock market studies have provided valuable information consistent with positive average improvements, the conventional event study approach is subject to two important estimation problems. The first, the estimation dilemma, arises when the announcement of the event does not ensure successful completion of the event. This forces the investigator to choose between truncated event windows that measure only a part of the value effect of a successful transaction, and long-windows that introduce severe noise and benchmark errors.

The second problem is that event-related returns are infected with a bidder revelation bias described by several authors (Bradley, Desai and Kim [1983], Jensen and Ruback [1983], and Roll [1986]). Takeover bids are sometimes announced concurrently with other disclosures; and a bid may in itself reveal information about the value of the bidder not arising from the deal, such as the bidder's stand-alone cash flow prospects or the empire-building propensities of management.

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the improvement is always zero in the initial contest, but after an initial failure the bidder always makes a negative NPV acquisition, then the stock return will be lower than the calculation in Section III. The negative stock return, in combination with the reduction in probability of success associated with the arrival of a competing bid, would tend to be attributed to a positive value improvement.

This paper estimates whether and by how much takeovers are perceived by investors as improving target and bidder firm value. We offer an approach to estimating perceived value improvements, the *probability scaling method*, that addresses simply the estimation dilemma. Furthermore, we offer an approach that escapes both the estimation dilemma and the bidder-revelation bias. This approach, the *intervention method*, is based on a model of the stock returns of an initial bidder when a competing bid occurs.

There are seven main findings in our sample of tender offers. (Some of these findings are tentative, and are subject to further fine-tuning described in the text of our implementation of the methodology.) First, our estimates indicate that investors perceive average value improvements to be large and positive—about 50% of the target’s pre-takeover equity value. The conclusion that takeover improvements are on average positive is robust with respect to both model specification and empirically plausible variations in the estimated parameters. Second, the perceived value improvement is much larger than estimates based on short-window initial bid returns. Third, there is no evidence that bidders profit from buying targets. Average value improvements are not significantly different from the average premia paid. Thus, most of the average successful premium paid can be explained by value improvement. Fourth, estimated value improvements are similar pre- and post- Williams Act and associated legislation. Fifth, acquisitions by a large bidder of a small target improve value more than ‘mergers of equals.’ Sixth, there is no sign of high average value improvements from takeovers during the merger boom of the mid-to-late 1990’s. Finally, estimated value improvements are of similar magnitude for friendly and hostile transactions.

From a policy standpoint, the evidence of positive value improvements, and that improvements are larger than estimates based on traditional unadjusted returns, tends to support the view that takeovers are usually desirable, so that regulation of takeovers should not be unduly restrictive. Of course, policy discussion should also take into account (as discussed at the end of Section I) the issues of possible errors in market perceptions, redistributions of wealth from stakeholders such as customers and employees, the disciplinary or distortive effects of the *ex ante* threat of takeover, and the *ex ante* costs of locating targets.

The probability scaling and intervention methods can be used to relate value improvements to other variables suggested by intuition or theories of takeover. For example, an interesting issue that could be addressed using the intervention method is whether the arrival of white knights blocks superior hostile acquisitions. As another example, the method may be useful in for understanding how other cross-sectional variables relate to value improvements. The free cash flow theory of Jensen (1988) implies greater overpayment by bidders with high free cash flow; empirically, bidder cash flow is related to bidder stock returns (Lang, Stulz, and Walkling [1991]). Other variables have been suggested as indicating

managerial motives on the part of the bidder, and hence lower value improvement, such as high target  $q$ . Since cross-sectional variables may be related to the extent to which the announcement of an event ensures success, and to the information that a bid conveys about a bidder, the intervention method can be useful in estimating full effects and separating cross-sectional value versus revelation effects.

## Appendix A: Value Improvements from Signalling

The discussion in Section I.A is based on the distinction between *creation* of value and *revelation* about value (recognizing, of course, that often an action does both of these to differing degrees). In concrete terms, this is the difference between the firm obtaining a chest filled with bullion and outsiders discovering that the firm already has the chest of bullion. It is sometimes argued that an action can create value as a direct result of revealing value. I.e., revealing credibly to outsiders that the firm has a chest filled with 45 gold coins may enable the firm to obtain an extra five coins.<sup>39</sup> Thus, even if the manager's goal is to maximize underlying value (the total number of gold coins the firm gets), there can be an incentive to take actions to signal high value.<sup>40</sup> Our analysis is consistent with the possibility of signalling.

Even though value creation and value revelation can interact, they are conceptually distinct. As will be illustrated momentarily, even in a signalling setting the increase in stock price associated with a corporate action is an invalid measure of the effect of that action on underlying value. Thus, even if signalling incentives were to play a significant role in the decision to make a takeover bid, it is important to have a method to disentangle the revelation effect of the takeover from its effect on underlying value.

To illustrate concretely, let us modify the previous example. Consider a bidding firm which consists of a chest filled with gold coins. Suppose the market's expectation of the number of coins in the chest is 200, but actually the chest has 245. Assume that if the market learns promptly that there are 245 coins, the firm will receive 5 more gold coins, increasing its underlying value to 250. Thus, signalling not only reveals value (245 versus 200), it creates value (250 versus 245). There is no other value improvement associated with the takeover. Suppose that a takeover bid is the only way to reveal the existence of the 45 extra coins, and that a bid is a credible signal. Then the value improvement for the bidder associated with a takeover bid is 5 (the extra 5 coins), but the stock return will reflect the favorable revelation of 45 ( $= 245 - 200$ ) as well as the 5 extra coins, and therefore overestimates severely the underlying improvement. A naive observer would conclude that the takeover bid provides the bidder with 50 extra coins, when in fact it obtains only 5. Thus, it remains essential to distinguish value creation from value revelation even when signalling can create value.

There is a further distinction of importance here. The value created by signalling is different from creating value through combination of firms. For example, a takeover bid may signal value, even though, owing to target defensive measures, regulatory intervention or a competing bid, the offer is never actually consummated. Thus, it is important to distinguish between creation of value through signalling (the 5 coins, in the example) and creation of value through combination (the value improvement of 40 in the numerical example in the

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<sup>39</sup>For example, revealing the existence of the 45 gold coins may allow the firm to raise capital more cheaply. Customers and other stakeholders may be more willing to deal with a firm perceived to be prosperous than one perceived at risk of financial distress (Titman [1984]). On the other hand, revealing higher value may stimulate competitors to enter the industry, and hence could also *reduce* value.

<sup>40</sup>However, signalling incentives are probably often present even though signalling does not increase underlying firm value. For example, a manager may want to boost the short-term stock price to improve his personal reputation, even though this does not increase long-run shareholder value. In fact, in most signalling models starting with Spence, signalling does not improve the underlying characteristic being signalled.

main text). This paper focuses on creation of value through combination, rather than through revelation.<sup>41</sup>

The intervention method estimates value improvements that derive from combination, not from signalling. The arrival of a competing bid says little about the stand-alone value of the first bidder. Hence, in our example, when a competing bid arrives, the first bidder's stand-alone value is still assessed by the market to be 250 (which still includes the revelation of 45 and the signalling-induced value improvement of 5). Thus, as illustrated in the numerical examples, the intervention method still extracts a value improvement of 40 if the gain from combination is 40, and 0 if the gain from combination is 0.

## Appendix B: Alternative Modelling Specifications

### Competing Bidder Information

Suppose that  $\bar{V}_3 > \bar{V}_1$ , *i.e.*, the arrival of a competing bid causes an upward revision in the assessed valuation of the first bidder. Specifically, suppose that the arrival of a competing bid reveals a larger post-takeover value of the target,  $\bar{V}_3 = K\bar{V}_1$ ,  $K \geq 1$ . We abbreviate  $\bar{V}_1$  as  $\bar{V}$  in the following. Substituting into equations (10), (11), and (12), and solving gives

$$\frac{\bar{V}}{V_0^T} = \frac{R_3 \frac{P_1}{V_0^T}}{K Pr(S|\theta_3) - Pr(S|\theta_1)} + \alpha \left( \frac{Pr(S|\theta_3) - Pr(S|\theta_1)}{K Pr(S|\theta_3) - Pr(S|\theta_1)} \right) + \frac{(1 - \alpha) \left[ Pr(S|\theta_3) \frac{\bar{B}_3}{V_0^T} - Pr(S|\theta_1) \frac{\bar{B}_1}{V_0^T} \right]}{K Pr(S|\theta_3) - Pr(S|\theta_1)} \quad (15)$$

Based on the discussion in the main text, we believe that  $K$  is likely to be close to one. The implied IRATIOS, which are increasing in  $K$ , are provided in the first two columns of Table 10 (Table under revision). This simulation supports the conclusion of positive average value improvements; large values of  $K$  lead to implausibly high values for  $\bar{V}/V_0^T$ .

### Valuation/Success Correlation

It is likely that success of the initial bidder is positively correlated with the value improvement, because a high valuation first bidder will probably be willing to offer more. The use of logit-based probability estimates, which generated similar results to our basic analysis, addresses this issue to the extent that the independent logit variables are related to the first bidder's valuation. In any case, the potential bias is a subtle one, because estimates are based on the *change* in probability of success when a competing bid occurs.<sup>42</sup> Similarly, it can plausibly be argued that if improvements are common across bidders, a high value

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<sup>41</sup>Even though *revelation* of information may be highly significant in takeovers, we think that the amount of *creation of value* resulting from such revelation may be relatively minor. As mentioned earlier, revelation of higher value may either increase or decrease fundamental value. Except in rare circumstances, it seems likely that learning about higher value will lead to a much smaller actual increase in value (real inflow of more gold coins).

<sup>42</sup>The most plausible presumption is probably that the arrival of a competitor has a smaller impact on probability of success when the valuation is high. Then for a high valuation first bidder, the drop in probability of success is overestimated, which implies that *IRATIO* is an underestimate. (Because the negative abnormal return is attributed excessively to the drop in probability of success rather than to a large value improvement.) Conversely, for low (but positive) valuation firms, the drop in probability of

improvement increases the probability of a competing bid arrives. Again, the potential bias implied by this effect is subtle, because the *ex ante* probability of a competing bid is overestimated for some contests and underestimated for others.<sup>43</sup> We therefore believe that it is unlikely that these effects would have much effect on the conclusions of this paper.

## Future Acquisitions

Suppose that the first bidder can find another identical target with probability  $\gamma$  after failure to acquire the first target. Then equations (12) and (14) become

$$\begin{aligned}\bar{\pi}_1 &= Pr(S|\theta_1)[\alpha(\bar{V} - V_0^T) + (1 - \alpha)(\bar{V} - \bar{B}_1)] + \\ &\quad \gamma Pr(S|\theta_1)[1 - Pr(S|\theta_1)][\alpha(\bar{V} - V_0^T) + (1 - \alpha)(\bar{V} - \bar{B}_1)]\end{aligned}\quad (16)$$

$$\begin{aligned}\bar{\pi}_3 &= Pr(S|\theta_3)[\alpha(\bar{V} - V_0^T) + (1 - \alpha)(\bar{V} - \bar{B}_3)] + \\ &\quad \gamma Pr(S|\theta_1)[1 - Pr(S|\theta_3)][\alpha(\bar{V} - V_0^T) + (1 - \alpha)(\bar{V} - \bar{B}_1)],\end{aligned}\quad (17)$$

$$\frac{\bar{V}}{V_0^T} = \frac{R_3 P_1 / V_0^T}{Pr(S|\theta_3) - \delta} + \alpha + \frac{(1 - \alpha) \left[ Pr(S|\theta_3) \frac{\bar{B}_3}{V_0^T} - \delta \frac{\bar{B}_1}{V_0^T} \right]}{Pr(S|\theta_3) - \delta}, \quad (18)$$

where  $\delta \equiv Pr(S|\theta_1)\{1 + \gamma[Pr(S|\theta_3) - Pr(S|\theta_1)]\}$ . *IRATIO* decreases as a function of  $\gamma$ , but the effect is weak. As shown in columns 3 and 4 of Table 10 (Table under revision), the estimated value improvement is still positive and substantial for plausible values of  $\gamma$ . The effect of  $\gamma$  on *IRATIO* would be stronger if, after a second failure, the bidder again had a probability of turning to a third target and so on. As shown in columns 3 and 4 of Table 10 (Table under revision), the estimated value improvement is still positive and substantial for plausible values of  $\gamma$ .

## Sale of Shares to Another Bidder

We now allow for the possibility that an unsuccessful initial bidder can sometimes profit by selling his holdings to a successful competing bidder. Let  $Pr(S^2|\theta)$  denote the probability of arrival and success of the second bidder, and let  $\beta$  denote the expected winning bid of the second bidder. Then

$$\bar{\pi}_1 = Pr(S|\theta_1)[\alpha(\bar{V} - V_0^T) + (1 - \alpha)(\bar{V} - \bar{B}_1)] + \alpha Pr(S^2|\theta_1)(\beta - V_0^T) \quad (19)$$

$$\bar{\pi}_3 = Pr(S|\theta_3)[\alpha(\bar{V} - V_0^T) + (1 - \alpha)(\bar{V} - \bar{B}_3)] + \alpha Pr(S^2|\theta_3)(\beta - V_0^T) \quad (20)$$

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success is underestimated, so that *IRATIO* is an overestimate. Under these conditions this potential bias changes the relative magnitude of *IRATIO* for different firms, but it does not imply any obvious bias in overall sample averages.

<sup>43</sup>If the true improvement is high, the arrival of a competing bid would be less of a surprise than our calculations indicate. For such contests, the improvement is underestimated. On the other hand, if the true improvement is low, the arrival of a competing bid would be more of a surprise than our calculations indicate. For such contests, the improvement is overestimated. The effect on overall sample averages is unclear.

$$\frac{\bar{V}}{V_0^T} = \frac{R_3 P_1 / V_0^T}{Pr(S|\theta_3) - Pr(S|\theta_1)} + \alpha + \frac{(1 - \alpha)(Pr(S|\theta_3)\bar{B}_3/V_0^T - Pr(S|\theta_1)\bar{B}_1/V_0^T)}{Pr(S|\theta_3) - Pr(S|\theta_1)} - \frac{\alpha(\beta/V_0^T - 1)[Pr(S^2|\theta_3) - Pr(S^2|\theta_1)]}{Pr(S|\theta_3) - Pr(S|\theta_1)}. \quad (21)$$

As a rough approximation we replace  $\beta$  with our estimates of the expected price paid by a successful first bidder conditional on the arrival of a competing bidder,  $\bar{B}_3$ . The unconditional probability of a second bidder winning is the probability that a second bidder arrives multiplied by the probability given arrival that the second bidder wins,  $Pr(S^2|\theta_1) = Pr(\text{Competing Bid Occurs})Pr(S^2|\theta_3)$ .  $Pr(\text{Competing Bid Occurs})$  is estimated as 71/290. Thus, only one of the other two probabilities is a free variable. *IRATIO* for different possible values of  $Pr(S^2|\theta_3)$  are given in columns 5-7 of Table 10 (Table under revision). A benchmark value for this variable is .5, the case in which, given the arrival of a competing bidder, the first and second bidder have equal probabilities of winning. Column 6 gives the estimated improvement ratio with the bidders' actual initial shareholdings in the target. Column 7 provides alternative numbers assuming larger initial shareholdings.



## References

- Bagnoli, Mark, Roger Gordon and Barton Lipman, 1989, Repurchase as takeover defense, *Review of Financial Studies* 2, 423-443.
- Barber, Brad and John Lyon, 1997, Detecting long-run abnormal stock returns: The empirical power and specification of test statistics, *Journal of Financial Economics* 43, 341-372.
- Berkovitch, E., and M.P. Narayanan, 1990, Competition and the medium of exchange in takeovers, *Review of Financial Studies* 3, 153-174.
- Betton, Sandra and Eckbo, Bjorn Espen, 1998, "State-contingent payoffs in takeovers: New Structural Estimates," Dartmouth College.
- Bhagat, Sanjai, Andrei Shleifer and Robert Vishny, 1990, Hostile takeovers in the 1980's: The return to corporate specialization, *Brookings Papers on Economic Activity*, 1-72.
- Bradley, Michael, Anand Desai and E. Han Kim, 1983, The rationale behind inter-firm tender offers: Information or synergy? *Journal of Financial Economics* 11, 141-153.
- Bradley, Michael, Anand Desai and E. Han Kim, 1988, Synergistic gains from corporate acquisitions and their division between stockholders of target and acquiring firms, *Journal of Financial Economics* 21, 3-40.
- Brous, Peter A., and Kini, Omesh, "A Reexamination of Analysts' Earnings Forecasts for Takeover Targets," *Journal of Financial Economics*, 33(2), April (1993):201-225.
- Comment, Robert and Jarrell, Gregg A., 1987, Two-Tier and Negotiated Tender Offers: The Imprisonment of the Free-Riding Shareholder, *Journal of Financial Economics*, 19, 283-310.
- Eckbo, B.Espen, 1983 "Horizontal Mergers, Collusion and Stockholder Wealth," *Journal of Financial Economics*, 11(1-4), 241-273.
- Eckbo, B.E., Giammarino, R. and Heinkel, R. "Asymmetric Information and the Medium of Exchange in Takeovers: Theory and Evidence." *Review of Financial Studies*, 3, (1990):651-76.
- Fishman, Michael, 1988, A theory of pre-emptive takeover bidding, *Rand Journal of Economics* 19, 88-101.
- Fishman, M.J., "Preemptive Bidding and the Role of Medium of Exchange in Acquisitions", *Journal of Finance*, 44, (1989):41-58.
- Franks, Julian, Harris, Robert, and Titman, Sheridan, 1991, "The Post-Merger Share-Price Performance of Acquiring Firms." *Journal of Financial Economics*, 29, 81-96.
- Grossman, Sanford and Oliver Hart, 1980, Takeover bids, the free-rider problem, and the theory of the corporation, *Bell Journal of Economics* 11, 42-64.
- Hansen, Robert G., "A Theory for the Choice of Exchange Medium in Mergers and Acquisitions", *Journal of Business*, 60, (1987):75-95.
- Healy, Paul M., Krishna G. Palepu and Richard S. Ruback, 1992, Does corporate performance improve after mergers?, *Journal of Financial Economics* 31(2), 135-175, April.

- Hirshleifer, David and Sheridan Titman, 1990, Share tendering strategies and the success of hostile takeover bids *Journal of Political Economy* 92, 295-324.
- Jarrell, Gregg A., 1985, The wealth effects of litigation by targets: Do interests diverge in a merge? *Journal of Law and Economics*, 209-232.
- Jarrell, Gregg A., James A. Brickley, and Jeffry M. Netter, 1988, The market for corporate control: The empirical evidence since 1980, *Journal of Economic Perspectives* 2, 49-68.
- Jarrell, Sherry, 1996, The Post-Merger Performance of Corporate Takeovers, Unpublished working paper, Emory University.
- Jensen, Michael, 1988, Takeovers: Their causes and consequences, *Journal of Economic Perspectives* 2, 21-48.
- Jensen, Michael C. and Ruback, Richard S. "The Market for Corporate Control: The Scientific Evidence." *Journal of Financial Economics*, (1983):5-50.
- Kaplan, Steven and Michael S. Weisbach, 1991, The success of acquisitions: Evidence from divestitures, *Journal of Finance* 47, 107-138.
- Kothari, S. P. and Jerold Warner, 1997, Measuring long-horizon security price performance, *Journal of Financial Economics* 43, 301-339.
- Lang, Larry, Rene Stulz and Ralph Walkling, 1991, A test of the free cash flow hypothesis: The case of bidder returns, *Journal of Financial Economics*, 29, 315-336.
- McCardle, Kevin F., and Viswanathan, S., "The Direct Entry versus Takeover Decision and Stock Price Performance around Takeovers," *Journal of Business*, 1994, 67(1), 1-43.
- McLaughlin, Robyn M., 1990, Investment banking contracts in tender offers: An empirical analysis, *Journal of Financial Economics*, 207-228.
- Morck, Randall, Andrei Shleifer and Robert W. Vishny, 1990, Do managerial objectives drive bad acquisitions, *Journal of Finance* 45, 31-48.
- Mueller, Dennis. "Mergers and Market Share," *Review of Economics and Statistics*, 47, (1985):259-267.
- Myers, Stewart and Nicholas Majluf, 1984, Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics* 13, 187-221.
- Opler, Timothy and Weston, J. Fred. "The Impact of Mergers on Operating Performance," Working Paper, Southern Methodist University, 1992.
- Porter, Michael, "From Competitive Advantage to Corporate Strategy," *Harvard Business Review*, 87, (1987):43-59.
- Pound, John, "The information effects of takeover bids and resistance," *Journal of Financial Economics*, 207-228.
- Ravenscraft, David and Frederick Scherer, 1987a, "Life after Takeovers," *Journal of Industrial Economics*, 36, 147-156.

- Ravenscraft, David and Frederick Scherer, 1987b, *Mergers, Selloffs, and Economic Efficiency* (Brookings, Washington, D.C.).
- Roll, Richard, 1986, The hubris hypothesis of corporate takeovers, *Journal of Business* 59, 197-216.
- Schwert, William, 1996, "Markup Pricing in Mergers and Acquisitions," *Journal of Financial Economics*, 41, pp. 153-92.
- Shleifer, Andrei and Robert Vishny, 1986, Large shareholders and corporate control, *Journal of Political Economy* 96, 461-488.
- Shleifer, Andrei and Robert Vishny, 1990, Managerial entrenchment: The case of manager-specific investment, *Journal of Financial Economics* 25, 123-139.
- Stulz, Rene, 1988, Managerial control of voting rights: Financing policies and the market for corporate control, *Journal of Financial Economics* 20, 25-54.
- Titman, Sheridan, 1984, The effect of capital structure on a firm's liquidation decision. *Journal of Financial Economics*, 13(1), 137-52.
- Walkling, Ralph, 1985, Predicting tender offer success: A logistic analysis, *Journal of Financial and Quantitative Analysis* 20, 461-478.
- White, Halbert, 1982, Maximum likelihood estimation of misspecified models, *Econometrica* 50, 1-25.
- Wier, Peggy, "The costs of antimerger lawsuits: Evidence from the stock market," *Journal of Financial Economics*, 11(1-4), 207-224.