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The Reverse LBO Decision and Firm Performance: Theory and Evidence

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ABSTRACT

We investigate the transition from private to public ownership of companies that had previously been subject to leveraged buyouts (LBOs). We show that the information asymmetry problem firms face when they go to public markets for equity, as well as behavioral and debt overhang effects, will produce a pattern in which superior performance before an offering should be expected, with disappointing performance subsequently. We find empirical evidence of this phenomenon by studying 62 reverse LBOs that went public between 1983 and 1987. The market appears to anticipate this pattern.

IN 1991, 56 LEVERAGED buyouts (LBOs) returned to the public equity markets, part of a broader phenomenon in which a large fraction of LBOs go public again—hence becoming "reverse LBOs." Kaplan (1991) reports that 45 percent of a sample of large LBOs completed between 1979 and 1986 later returned to public ownership. Moreover, reverse LBOs tend to be larger than the average initial public offering (IPO).[1] In sum, transitions from the LBO form to public ownership have become a widespread and economically significant phenomenon.

We find strong evidence that the return to public ownership of reverse LBOs coincides with a peak in their operating performance. Their operating income as a percentage of total assets grew by about seven percentage points in the preoffering year. Comparison firms in the same industries show a slight decline in the same performance measure. Moreover, in the preoffering year, reverse LBOs outperform continuing LBOs. In the year after the

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[1] The largest IPO in 1991 was the Owens-Illinois reverse LBO, which raised $528 million in its December 11 offering. Other 1991 reverse LBOs include Duracell, AnnTaylor, and Filene's Basement.

offering, however, reverse LBOs disappoint. Their performance worsens dramatically in the first public year, falling by about three points, which is ten points below the change in their own previous year and four points below their public comparison firms. The net change in performance for the two-year period from the beginning of the preoffering to the close of the postoffering year is four percentage points above the norm.

We discuss two possible explanations for this pattern of superior performance before the IPO, followed by disappointing performance: (1) asymmetric information: managers use their private information to time the IPO, and/or manipulate performance, (2) pure selection: because of debt overhang and behavioral effects, good performers will be more likely to go public than poor performers.

An intriguing question is whether the market manages to disentangle the information it receives, and thus to anticipate the disappointing performance in the post-IPO era. If the aftermarket performance of reverse LBO stocks is normal, that would indicate that the market appropriately discounts the effects we describe. If it is below average, that would suggest that the market is "fooled" at the time of the IPO, and only realizes its mistake later. Our evidence indicates that the market is not fooled: over the two years following the IPO, reverse LBOs' stocks *outperform* comparison firms, although the difference in performance is not statistically significant.

Previous work on LBOs has given little attention to the reentry issue. Muscarella and Vetsuypens (1990) focus on the private period, not on the return to public ownership. The extensive IPO literature has been devoted almost exclusively to the share price performance of new issues, not to operating performance.[2] Holthausen and Larcker (1992) study the financial performance of reverse LBOs. We discuss their results in Section VI.

The paper is organized as follows. In Section I we review alternative explanations for the patterns we discover, and present an adverse selection model of reverse LBO timing. Section II presents the data and test methodology. In Section III we examine how reverse LBOs perform relative to continuing LBOs. Section IV compares the performance of reverse LBOs before and after the IPO. Section V examines the stock price performance of reverse LBOs after the IPO. Section VI discusses the implications of our results, and Section VII concludes.

I. The Reverse LBO Decision and Firm Performance

Our hypotheses fall into two categories: (1) asymmetric information: managers use their private information to time the IPO, and/or manipulate

[2] Elton, Gruber, and Rentzler (1987, 1989) analyze the performance of publicly offered commodity funds and also find a pattern of disappointing postoffering performance. However their context is very different from ours since—as they show—the performance of commodity funds is essentially random, which implies that it can be neither influenced nor predicted by management (a crucial difference from the IPOs we analyze).

performance, and (2) pure selection: because of debt overhang and behavioral effects, good performers will be more likely to go public than poor performers.

A. Information Asymmetry Effects

A.1. Adverse Selection in the IPO Process—Hidden Information

LBOs that want to go public again will have difficulty giving the market credible information about their future prospects.[3] Even a firm with genuinely good prospects typically cannot convey concrete evidence as to its future, and firms with mediocre prospects can make claims that cannot be decisively refuted.

In its pricing of an IPO, the market will take into account the possibility that the firm is a lemon (Akerlof (1970))—that is, its future performance will be disappointing relative to the past. Indeed, this is essentially the hidden information problem discussed by Myers and Majluf (1984). They consider a situation in which managers know more than the market does about the future prospects of the firm. Assuming that managers act in the interest of the existing shareholders, they have an incentive to issue stock when the market overvalues the firm (when the managers' private information is unfavorable). The market is not fooled, however. The very fact that the firm issues stock immediately reveals information about its true state to the market.

We offer a different model of a somewhat parallel situation. In our setting, managers do not know in advance exactly how the firm will perform, but they do know the expected value of its performance. Outside investors have a prior probability distribution on this expected value. The firm's realized performance is revealed when it goes public.

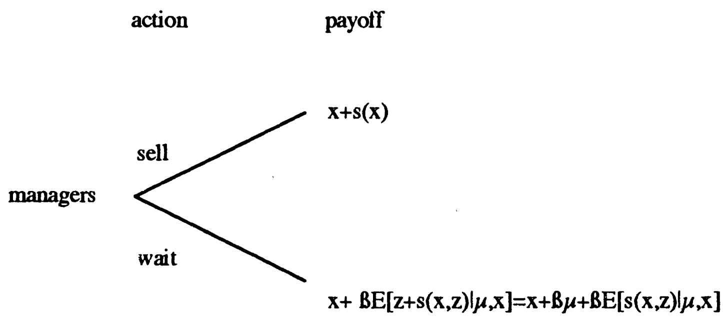
Suppose there are two periods, 1 and 2, and privately held firms can go public at the end of either period. All managers have the same discount factor β. The market pays m per dollar of expected per-period earnings. Consider a firm with expected per-period earnings μ. At the end of period 1 its managers observe the firm's realized period 1 earnings, x, and then decide whether to take the firm public. If they decide to sell, they report x in the offering prospectus, with supporting attestations from their accountant. If they wait, we assume that they have to sell the firm at the end of period 2; then the prospectus will report the firm's realized earnings in period 2, z, as well as x.

We assume that β and m are common knowledge. The managers know μ, but the market has only a prior distribution on μ, $p(\mu)$, which is common knowledge. The per-period earnings distribution is given by $f(x;\ \mu)$, also common knowledge. Earnings are identically independently distributed. We use $s(x)$ to denote the dollar amount paid by the market for the firm, if the

[3] The terms "hidden action" and "hidden information" are due to Kenneth Arrow (1985). They replace the more traditional but less descriptive "moral hazard" and "adverse selection."

managers sell in period 1, and $s(x, z)$ for the dollar amount paid by the market if the managers wait to sell until the end of period 2.

At the end of period 1 (after observing x), the managers face the following choice:



Claim: The managers will base their decision on the rule: "Sell at the end of period 1 if $x > h(\mu)$, where h is some upward-sloping function to be determined (the "cutoff curve"); otherwise sell in period 2." (See Appendix.)

The intuition for this claim is that firms go public when they get a good draw relative to their own mean.

For $x = h(\mu)$, the manager is indifferent between waiting and selling, so that at that point:

$$s(x) = \beta\mu + \beta E_z[s(x, z)|\mu, x] \tag{1}$$

The timing of the IPO reveals information to the market about the quality of the firm: if the manager sells in period 1, then it must be that $\mu < h^{-1}(x)$. If he sells in period 2, then $\mu \geq h^{-1}(x)$.

As an example, in the Appendix we derive the equation of the cutoff curve $x = h(\mu)$ under the following additional assumptions: earnings are uniformly distributed over $(0, 2\mu)$, and the investors' prior on μ is given by $p(\mu) = K\mu^2 e^{-\mu}$, for some constant K $(0 \leq \mu \leq \infty)$. The equation of the curve is (with $y = x/2$):

$$2m + m\frac{\mu^2 e^{-\mu} - y^2 e^{-y}}{(\mu + 1)e^{-\mu} - (y + 1)e^{-y}} = \beta\mu + \beta m(1 + \mu) \tag{2}$$

Choosing for instance $\beta = 0.75$ and $m = 10$, we obtain the curve shown in Figure 1.

Changing the values of the parameters reveals some intuitive properties of the $x = h(\mu)$ schedule. As β decreases, the $x = h(\mu)$ schedule shifts to the right: a more impatient manager has a lower selling threshold in terms of period 1 realized earnings. Put differently, if it is common knowledge that the manager is exceptionally impatient (for instance, if he is forced to sell for liquidity reasons), the market pays more, other things equal. In our setting, competition between investors prevents them from taking advantage of managerial impatience. More generally, sales in desperation may do better. The

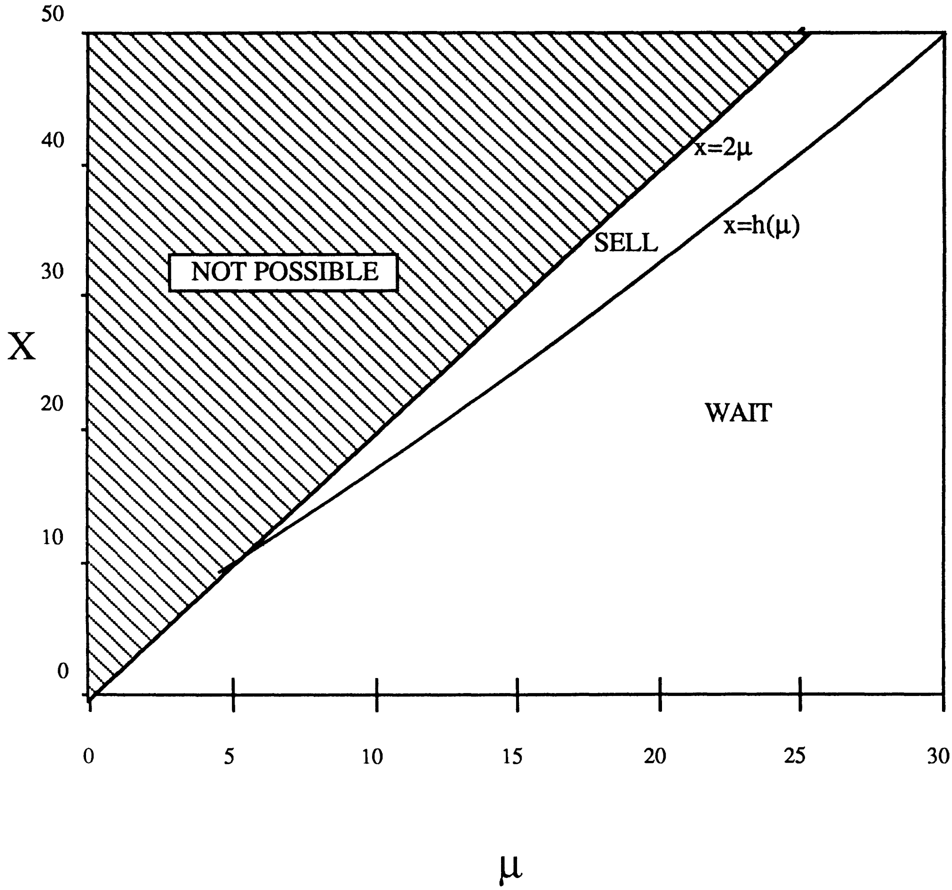


Figure 1. Cutoff curve. μ is the firm's expected performance (known only to managers). X is the firm's realized period 1 performance, which is disclosed in the prospectus if the firm goes public ("sells") in period 1. The schedule $X = h(\mu)$ (the "cutoff curve") gives, for each possible value of μ, the value of X for which managers are indifferent between selling in period 1 and waiting to sell until period 2. The cutoff curve is drawn assuming that $p(\mu)$, the market's prior probability distribution on μ, is given by $p(\mu) = \frac{1}{2}\mu^2 e^{-\mu}$ $(0 \leq \mu < \infty)$, that β (the managers' discount factor) is equal to 0.75, and that m (the market price of 3a dollar of expected per-period earnings) is equal to 10.

seller of an automobile can avoid the lemon accusation if she can convincingly demonstrate that she has been transferred overseas.

It is worth noting that in our setting good firms (i.e., high-μ firms) are more likely to sell in the first period than bad (i.e., low-μ) firms. By staying private until period 2, low-μ firms are able to mix with high-μ firms that stayed private only because they got a bad draw in the first period.[4]

[4]By contrast, in a Myers-Majluf–type framework, only bad firms sell equity, because investors observe only the fact that the firm issues equity. In our setting investors also observe x, a noisy signal about the firm's true value.

This highly stylized model yields some testable predictions: among reverse LBOs, we should find a large number whose future prospects will not live up to a naive extrapolation of their promising recent past. They go public this year because they know that this year's performance is above average. Moreover, since they chose to stay private last year, last year's performance must have been below the firm's true potential, or at least below the performance required to make it a go-public year. This suggests that, even if hidden information were the only effect at work, we should expect a strong gain in performance from the year before the IPO to the year of the IPO.

A.2. Performance Manipulation—Hidden Action

In evaluating an IPO, investors rely on the information provided in the offering prospectus. Managers, who are close to owners and typically own significant equity themselves, have a strong interest in boosting reported performance just before the IPO, so as to improve the offering price. They can do this in two ways, which we label *inspection period striving* and *performance borrowing.*

Consider a worker whose annual pay is set by examining the value of his product in a brief inspection period, say a day, and then multiplying that value by the 220 working days in the year. He would work like a devil on the day he is being watched. Consider now a corporate manager who owns 10 percent of a company that normally earns $1 million and will sell at eight times earnings when it goes public. Every additional $1,000 the firm earns in the year before going public will mean another $800 for him. That is an extraordinary stimulus, in comparison with the $2.59 median increase in chief executive officer (CEO) compensation per $1,000 increase in firm value reported by Jensen and Murphy (1990) in a cross-sectional study of publicly held firms. Managers are likely to exert extraordinary effort before the IPO of a firm in which they hold significant equity.

The managers will benefit if they can find new ways to boost earnings. Perhaps the easiest way will be to borrow performance from other periods. To borrow from the future, they can discount prices to boost sales temporarily, or defer expenses (such as research and development (R & D) or employee development) that will yield returns only over a longer period in the future. Managers can even borrow past performance. If an IPO is planned two years hence, they can soft-pedal this year's earnings to boost those of next year, in that way improving both the growth record and the earnings in the pre-IPO year. Whether because of inspection period striving or performance borrowing, we would expect the firm's operating performance to improve more rapidly than normal during the year before an IPO.

Performance manipulation will be expected by the public. If the manager cannot demonstrate that he has not manipulated, manipulation will be assumed and will be factored into the multiple attached to the company's earnings. Thus, not only will the manager gain by manipulation, but he may find justification from doing so from the downgraded multiple.

Managers have strong incentives to manipulate performance *even if they do not sell their own stock.*[5] This is because in a reverse LBO, managers typically own a sizable share of the stock even after the IPO, and manipulation also benefits the shares they keep. Consider a manager who owns all n shares of a company before the IPO. Suppose that he sells s old shares, that the company sells c new shares, and that the sale is at m times earnings. After the sale, the manager owns $n - s$ of a total of $n + c$ shares outstanding.

Say the manager can boost total earnings this year by $\$B$, at the expense next year of $\$X$ in earnings for the company. What benefits and costs return to him? First, since each share earns $\$B/n$ more, the manager gets $\$smB/n$ extra directly from the sale. Second, the company reaps an additional $\$cmB/n$ for the shares it sells; the manager gets his proportional share, $(n - s)/(n + c)$, of these dollars. Third, the manager gets his proportional share of this year's extra earnings, $B(n - s)/(n + c)$. Next year he loses his proportional share of $\$X$. Thus his total dollar benefits are $(mB/n(s + c(n - s)/(n + c)) + B(n - s)/(n + c)$, and his total costs are $X(n - s)/(n + c)$, assuming no discounting.

If X is not too large, the manager benefits from manipulation. For concreteness, assume $n = 100$, $m = 10$, $B = 100$, $s = 20$, $c = 100$, implying that the manager sells 20 percent of his stake and ends up with 40 percent of the company after the IPO. His benefit from manipulation is 640; his cost is $0.4X$. He gains as long as $X < 1600$, if each extra dollar in earnings this year costs less than \$16 next year. Even if he sells no shares ($s = 0$), he will benefit from manipulation if $X/B < 1 + mc/n$, if the cost per manipulated dollar is less than one plus the price-earnings ratio times the fraction of the company sold to outsiders.

Averaging across firms in our sample, insiders sold 10 percent of their holdings in the IPO associated with the reverse LBO. After the IPO, they held on average 68 percent (median 49 percent) of the firm.

Given that manipulation is expected, is there any stock price penalty once the "disappointing" future numbers become known? No, assuming earnings fall just to the expected level, as determined by n, s, and c. Indeed, if this level is achieved, the stock price should not move at all.

A richer model would allow for unobservable variables, say the ability to borrow future sales, that can only be inferred by the public. If post-IPO earnings come in below expectation, such unobservables will be at least partially revealed to be unfavorable. The stock's long-run earnings expectation will be adjusted downward, and the stock price will fall. Since "cheap manipulators"—firms that can boost this year's earnings for a smaller sacrifice next year—have lower unadjusted earnings from any two-period path of

[5] Insider selling at the IPO obviously gives a negative signal to the market.

observed earnings, a desire not to be classified as a cheap manipulator will deter manipulation.[6]

Performance manipulation may go on even though it is both costly and fully disentangled by investors. The problem rests in the system, which does not permit ready transmission of information. Stein (1989, p. 656) models a similar situation. In his signal-jamming framework, managers myopically pump up earnings in order to raise forecasted value: "In equilibrium the market is *not fooled* by this jamming: it correctly conjectures that there will be a certain amount of earnings inflation, and takes this into account in making its predictions. In spite of being unable to fool the market, managers are "trapped" into behaving myopically."

Some degree of performance manipulation probably occurs in any firm.[7] This is one reason why accounting measures of performance are known to be unreliable. But in the case of an IPO, managers have very large *additional* incentives to present the company in the best possible light.[8]

B. Pure Selection

We identify two phenomena, behavioral decision and debt overhang, that may prevent poorly performing LBOs from going public—hence explaining why reverse LBOs tend to be unusually good performers. We label this a "pure selection" effect, because in contrast to adverse selection, it does not rely on information asymmetry between managers and investors.

[6] We thank a referee for suggesting that we think of a stock price penalty of $m^*X((n - s)/(n + c))$ once manipulation becomes known, where m^* is a decreasing function of the ratio of post-IPO to pre-IPO earnings. Including this m^* term, the manager's continuing holdings becomes a key factor in affecting the degree of manipulation. A manager who keeps substantial holdings provides reassurance that earnings have not been excessively manipulated in response to going public. The equilibrium of m increases because these retained shares are in effect held hostage against future earnings disappointments.

A second, contrary factor may come into play: in some contexts managers may be able to demonstrate future earnings potential. If this factor is important, we could find that managers can only sell most of their holdings when they are able to make such a demonstration. In our sample, we find—in a nonsignificant result—that the more the manager sells the lesser the future decline in operating performance.

[7] Zeckhauser and Pound (1990) build on this observation to study the effectiveness of monitoring by large shareholders. They argue theoretically—and verify empirically—that the presence of a large shareholder is likely to defuse the need for earnings manipulation, for both incentive and signaling reasons.

[8] An instructive example is provided by the Regina Company, which is part of our sample. Regina, a maker of vacuum cleaners, went public in 1985. The CEO, who held about 50 percent of the stock during the buyout, sold one-tenth of his stake for $2.1 million. Regina exhibited very strong stock price performance in the first two years following its IPO. In 1988, the CEO abruptly resigned and confessed to having manipulated the firm's reported results. (The resignation was prompted by a surge in customer complaints about quality.) The stock price dropped sharply, indicating that the extent of manipulation was a surprise to most investors.

B.1. Behavioral Decision

Less than fully rational behavior of some parties—what we call behavioral decision—may create a situation in which firms will be more likely to go public when their performance is unusually good relative to previous years.[9]

The buyers of IPOs may display behavioral strategies. We suspect that investors will shun a firm with poor earnings growth, quite apart from the offering price. Shiller's (1988) startling survey evidence indicates that most IPO investors do not seem to take the IPO price into account in their decision to invest. If price matters little, a low price cannot redeem an IPO with a poor past record, and investors will prefer firms with an apparent upward momentum.[10]

The sellers—including the firm's managers—may also fall prey to behavioral strategies. They may be reluctant to sell when they cannot get as much for the firm as they could have received earlier. One sees this pattern in homeowners who refuse to sell when real estate prices have fallen. They may hope that prices will bounce back; moreover, the loss of value may be less painful because it is not realized. Previous studies have documented this "reluctance-to-sell" or "disposition effect" in other contexts.[11]

Behavioral motives may play an indirect part, if one or more parties only *believes them to be present.* If either side thinks the other is prey to such biases, it will act accordingly,[12] which by itself will create a skewed set of offerings. For example, if sellers believe that buyers overvalue a record of strong earnings growth, when in fact buyers do not make this error, companies going public will be disproportionately strong.

B.2. Debt Overhang Creates a Selection Effect

LBO owners may be reluctant to raise outside equity if their debt is severely risky, because the IPO would bring cash to the company, thereby

[9] In the studies of publicly offered commodity funds by Elton, Gruber, and Rentzler (1987, 1989), self-selection of this nature is a prominent explanation of the severe postoffering decline in performance. Their interpretation is that "commodity trading advisers' performance is random and that the ones who are selected as advisers to public funds are the ones who, by pure chance, had a sequence of good returns."

[10] Why might investors "overpay" for firms with strong past growth? Such a strategy by individual investors is consistent with prospect theory (Kahneman and Tversky (1979)), which posits *decreasing returns to losses* as well as to gains. Firms with upward momentum have a price change distribution offering a high probability of small gains (if earnings continue to rise) and a small probability of a big drop (if earnings go flat or fall). Since big losses are underweighted in utility terms relative to small gains, the gamble may look attractive even though its expected value is negative. Thus, if many investors behave according to prospect theory, firms with good growth prospects will be advantaged in going public: they will reap more than they are worth on a discounted expected value basis.

[11] Shefrin and Statman (1985) find that investors tend to sell their winning investments early (possibly because of the satisfaction from realizing a good investment) and hold on to their losing ones (possibly to avoid regret). Ferris, Haugen, and Makhija (1988) find that trading volume for stocks that have declined in value is lower than for stocks whose value has increased.

[12] Indeed, through a process of infinite regress, all that is necessary is that each side thinks the other thinks he believes there is a bias, and so on.

reducing the risk and raising the price of its bonds.[13] At least some of the benefit from the new dollars would go to old debtholders, whereas only old equityholders would be giving up ownership. This reasoning suggests that if bonds are risky, reverse LBOs will be discouraged. A second step is required if debt overhang is to exert a selection effect—that is, to imply that strongly performing LBOs are more likely to go public. Strong LBO performance must also translate into less-risky debt, indeed debt that is sufficiently less risky to make it worthwhile to go public.

A caveat should be mentioned in even entertaining the hypothesis that debt overhang creates a selection effect. If transaction costs are sufficiently low the Coase Theorem (Coase (1960)) applies, and if the debtholders' gain from an IPO exceeds the loss to the old equity owners, it will be in the interest of debtholders to give up some of their rights in return for their reduction in risk. If recontracting is possible, even the presence of risky debt need not prevent an LBO from going public.

In sum, three factors are necessary for debt overhang to create a selection effect: bonds must be discounted because of risk; short-term performance improvements must be sufficient to ameliorate risk appreciably; and recontracting with bondholders must be sufficiently impeded that public stock offerings that would be attractive on net are prevented.

C. Empirical Predictions

If there were no informational asymmetries, behavioral decision or debt overhang effects would still imply that firms with strong performance go public. We would expect these selected firms to perform just as well in the next period as other firms with similar above-average records. That is, they would perform somewhat less well than in the current period, because of regression toward the mean. If IPOs experience a sharper fall in performance during the year following the IPO than comparison firms, then one of the asymmetric information phenomena, adverse selection or performance manipulation, must be at work. We shall now turn to some empirical data to investigate these effects.

II. Sample and Data

Our primary sample consists of 62 reverse LBOs, companies that went public between 1983 and 1987. We identified these companies from the following sources:

1. *Going Public: The IPO Reporter* regularly publishes IPO prospectus summaries, which indicate whether the offering firm previously underwent an LBO. Its January 1988 issue included a list of reverse LBOs for 1987.

[13] We thank a referee for suggesting that we include the debt overhang hypothesis in our analysis.

2. *Mergers and Acquisitions* published a list of reverse LBOs in its November-December 1987 issue (Ferenbach (1987)).

Our sample includes all of the 62 reverse LBOs identified in these sources. For each company, we collected performance data for periods before and after the IPO. Pre-IPO performance data were gathered from the IPO prospectus. Most often, when the IPO does not occur at the end of a fiscal year, the prospectus reports figures for the months immediately preceding the IPO, as well as the equivalent figures for the preceding year (making comparisons possible between years). Post-IPO performance data were obtained from COMPUSTAT. Operating income and total assets were noted for the calendar year in which the IPO occurred and for the following year.

We are interested in assessing the improvement in firms' operating performance. We chose operating income after depreciation (OI) normalized (divided) by total assets (AT) as our measure of performance. Performance improvement was measured as the change in this ratio: $[\Delta OI/AT](\text{year}) = [OI/AT](\text{year}) - [OI/AT](\text{year} - 1)$.[14] We use an improvement measure because investors assessing a firm presumably value the *improvement* of its earnings in addition to their *level.* A company with superior earnings growth before the IPO, with earnings per share going from \$1.50 to \$2.00 at the time of the issue, may well sell for more than one with successive earnings of \$2.00 and \$2.00.[15] The choice of operating income allows us to focus on the real effects of governance and ownership changes. Implicitly, our choice of performance measure assumes that accounting depreciation is an acceptable proxy for economic depreciation.[16]

III. Reverse LBOs, Continuing LBOs, and Comparison Firms

A. Reverse vs. Continuing LBOs

Would one expect reverse LBOs at the end of their private period to perform better or worse than other LBOs? One conjecture—we might call it the "LBO form outdated" theory—would be that reverse LBOs are mediocre performers. In this view, they go public again because they have exhausted the benefits of the LBO ownership form. Or, they need to go public because their profits are insufficient to cover their debt load. (Most reverse LBOs do devote significant funds to debt reduction.)[17]

[14] With this convention, if a firm has an operating income-assets ratio of 1 percent in year 0 and 2 percent in year 1, $[\Delta OI/AT](\text{year } 1) = 1$ percent.

[15] "I want a minimum 30% growth rate in earnings and revenues [in an IPO]," says a fund manager interviewed by *Business Week*, May 13, 1991.

[16] We also ran the same tests using change in operating margins (defined as operating income divided by sales) to ensure that our findings were robust against changes in the level of assets induced by the IPO. Results with the two measures proved to be qualitatively equivalent.

[17] If debt redemption is a consideration, tax reasons would make low-performing LBOs more likely to go public than high-performing LBOs. A low-performing firm has a lower expected marginal tax rate, making debt financing relatively less attractive. Mackie-Mason (1990) presents evidence that the higher a firm's tax loss carryforwards, the less likely it is to issue debt, and the more likely it is to issue equity.

We predict by contrast—on the basis of the arguments of Section II—that in most instances going public is an indicator of good times. Strong results before going public may reflect the need to convince the finicky capital market of the firm's favorable prospects. If so, LBOs may wait for a good year before attempting to go public again. Then reverse LBOs, in the preoffering year, should outperform continuing LBOs.

We wish to test the following null hypothesis:

H_0: *In the year before they go public, reverse LBOs perform as well as continuing LBOs.*

Our alternative hypothesis is:

H_1: *In the year before they go public, reverse LBOs perform better than continuing LBOs.*

This question has received little attention in the LBO literature. Even though studies of LBOs are based on samples containing both reverse and continuing LBOs, few analyze whether these two groups fare differently. One exception is Kaplan's (1989) study of management buyouts (MBOs). To test whether his results (which point to strong operating improvements during the management ownership period) suffer from sample selection bias, he compares various measures of performance for (1) LBOs that have public debt outstanding but have no public equity, and (2) a combined class of reverse MBOs and MBOs that were eventually sold back to public companies. He finds that in general the second group exhibits stronger performance than the first.

We gathered data on the operating performance of a sample of continuing LBOs: those companies among the LBOs listed by Lehn and Poulsen (1989) that filed 10-k forms. We found 25 such LBOs, four of which were dropped from the sample, either because the LBO was too recent (in one case the buyout occurred two months before the latest 10-k form we could find), or because the data we found were not usable.

There is no guarantee that our selection procedure yields an unbiased sample of continuing LBOs. After all, firms with public debt might be special. But there is no entirely satisfactory way to obtain data on a cross-section of continuing LBOs, since LBOs without public debt generally do not report their performance results.

Finding 1: In the year before they go public, reverse LBOs perform better than continuing LBOs.

We use [ΔOI/AT] as our measure of operating performance, and we focus on the latest year for which we could find performance information in the 10-k forms. In the period before they go public again, reverse LBOs outperform continuing LBOs (Table I). The performance difference is significant, more than 8 percent on our measure. Although reverse LBOs had more variable performance as well, on a Wilcoxon signed-rank test, the difference in performance was significant at the 0.001 level. Our choice of a nonpara-

Table I

Comparison of Industry-adjusted Performance between Reverse and Continuing LBOs

The sample of continuing LBOs includes those LBOs listed by Lehn and Poulsen (1989) that filed 10-k forms. We found 25 such LBOs, four of which were dropped, either because the LBO period was too short or because the data were not usable. The final sample consisted of 21 continuing LBOs.

Performance measure is the change in operating income after depreciation (OI) divided by total assets (AT): $[\Delta OI/AT](\text{year}) = [OI/AT](\text{year}) - [OI/AT](\text{year} - 1)$.

Industry-adjusted performance is defined as $[\Delta OI/AT](\text{LBO}) - [\Delta OI/AT](\text{industry})$, where $[\Delta OI/AT](\text{industry})$ is computed as the average $[\Delta OI/AT]$ for COMPUSTAT firms in the same four-digit SIC category.

Year of reference is the IPO year for reverse LBOs, and the latest year for which data were available for continuing LBOs.

	$[\Delta OI/AT](\text{LBO}) - [\Delta OI/AT](\text{industry})$		
Descriptive Statistics		Mean (%)	
Reverse LBOs		6.90[a]	
Continuing LBOs		−1.24	
	Min. (%)	Median (%)	Max. (%)
Reverse LBOs	−18.10	6.10	38.69
Continuing LBOs	−10.31	0.00	14.76

[a] Significant at the 1 percent level (two-tailed Wilcoxon signed-rank test).

metric test reflects a conservative approach, tending to favor the null hypothesis that LBOs are similar to control firms. The evidence is clear. Reverse LBOs perform substantially better than their peers in the year before going public, which suggests that favorable results are critical to going public at a price attractive to the sellers.

B. Continuing LBOs vs. Comparison Public Firms

One might wonder whether our results are driven by some special feature of poor performance among our sample of continuing LBOs. This does not seem to be the case (Table II). Each continuing LBO was matched with a randomly selected control firm in the same COMPUSTAT four-digit Standard Industrial Classification (SIC) category. Our procedure was to select the next firm in alphabetical order for which data were available for the relevant years, and whose total assets were between 50 and 200 percent of those of the continuing LBO. We set aside the size filter if it was not satisfied by any firm in the same four-digit SIC code.

Consistent with previous studies based on operating performance, we find that our continuing LBOs do slightly better than similar public firms in their industry. A Wilcoxon matched pairs signed-rank test shows this difference to be statistically significant (at the 5 percent level for a two-tailed test).

Table II

Comparison of Performance for 21 Continuing LBOs and 21 Matched Control Firms

The sample of continuing LBOs includes those LBOs listed by Lehn and Poulsen (1989) that filed 10-k forms. We found 25 such LBOs, four of which were dropped, either because the LBO period was too short or because the data were not usable. The final sample consisted of 21 continuing LBOs.

Performance measure is the change in operating income after depreciation (OI) divided by total assets (AT): $[\Delta OI/AT](\text{year}) = [OI/AT](\text{year}) - [OI/AT](\text{year} - 1)$.

For each continuing LBO, a matched control firm was chosen by selecting the next firm in alphabetical order in the COMPUSTAT list of firms in the same four-digit SIC category, provided that data were available for the relevant years and that its assets were between 50 and 200 percent of those of the continuing LBO. We set aside the size filter if it was not satisfied by any firm in the same four-digit SIC code.

Year of reference is the latest year for which performance data were available for the continuing LBOs.

	$[\Delta OI/AT]$		
Descriptive Statistics	Mean (%)		
Continuing LBOs	1.28		
Control firms	−2.83		
	Min. (%)	Median (%)	Max. (%)
Continuing LBOs	−10.22	0.19	29.25
Control firms	−24.97	−1.08	3.26
Wilcoxon matched-pairs signed-rank test for difference of means			
Smaller sum of ranks	50*		
(*) p-value	< 5% (two-tailed test)		

IV. Reverse LBO Performance before and after the IPO

A. Reverse LBOs Do Well before the IPO, then Disappoint

Consistent with our hypotheses—informational, behavioral, and debt overhang—we find that LBOs that go public have outperformed their peers. Is this merely because they are unusually good firms? Or do they manipulate performance or select propitious times to go public? To make a determination, we compared the performance of reverse LBOs before and after their public offering.

We compare, for each matched pair of companies, $[\Delta OI/AT](\text{IPO year})$ (i.e., the *improvement* in operating performance before the IPO) and the same measure for the following year, $[\Delta OI/AT](\text{IPO year} + 1)$. We also make the comparison using industry-adjusted numbers. Descriptive statistics on accounting data for reverse LBOs and the control sample (Table III) suggest two patterns.[18] First, the performance of reverse LBOs improves more in the

[18] The procedure for choosing control firms is identical to that described in Section III.

Table III

Performance Improvement before and after the IPO for Reverse LBOs and Matched Control Firms

Performance measure is the change in operating income after depreciation (OI) divided by total assets (AT): [ΔOI/AT](year) = [OI/AT](year) − [OI/AT](year − 1).

For each reverse LBO, a matched control firm was chosen by selecting the next firm in alphabetical order in the COMPUSTAT list of firms in the same four-digit SIC category, provided that data were available for the relevant years and that its assets were between 50 and 200 percent of those of the reverse LBO. We set aside the size filter if it was not satisfied by any firm in the same four-digit SIC code.

All significance levels are for a two-tailed Wilcoxon signed-rank test.

	[ΔOI/AT](IPO year)			[ΔOI/AT](IPO year + 1)		
Descriptive Statistics	Mean (%)			Mean (%)		
Reverse LBOs	6.58[a]			−2.77[b]		
Control firms	−1.46			0.87		
Reverse LBOs (industry-adjusted)	6.90[a]			−2.59[b]		
	Min. (%)	Median (%)	Max. (%)	Min. (%)	Median (%)	Max. (%)
Reverse LBOs	−16.13	4.68	32.25	−25.85	−1.89	10.69
Control firms	−29.81	−0.29	11.72	−24.94	0.66	45.42
Reverse LBOs (industry-adjusted)	−18.10	6.05	38.69	−26.11	−0.80	7.16

[a] Significant at the 1 percent level.
[b] Significant at the 5 percent level.

year before the IPO than does that of the control firms. Second, this improvement in performance is not sustained in the year after the IPO: indeed, reverse LBOs tend to do worse in their first public year than the control firms in that same year. The significance of these findings was confirmed by a Wilcoxon matched pairs signed-rank test. The results point to a very strong pattern of "disappointing" reverse LBO performance after the IPO. Hence we obtain:

Finding 2: In the year before going public, reverse LBOs perform better than other firms on average.

Finding 3: In the year after going public, reverse LBOs perform worse than other firms on average.

The decline in performance after the IPO less than offsets the pre-IPO gain: overall, reverse LBOs do well in the two-year period starting one year before the IPO.

In addition, in results not reported here, we find that for reverse LBOs in our sample [ΔOI/AT](IPO year − 1) is smaller than [ΔOI/AT](IPO year) on average (significant at the 5 percent level), and larger than for control firms, although not significantly. This suggests that the preoffering year performance of reverse LBOs is exceptional, even by the standards of sharp improvements in operating efficiency during the buyout period documented by earlier LBO studies.

B. Informational Effects Offer a Consistent Explanation of Findings

Were there no information asymmetry, the superior pre-IPO performance of reverse LBOs would be due solely to some feature of the preferences of the sellers and buyers of these firms, such as the behavioral effects outlined above, or a debt overhang effect. If high performers tend to be selected for IPOs, and no one is fooled, then an ordinary level of regression toward the mean would be expected. If we find merely this level, that would suggest there are no further effects due to the imperfect flow of information. On the other hand, if the performance of reverse LBOs during the year following the IPO declines more substantially than does that of other firms that experienced similar performance in the year before the IPO, informational effects, either adverse selection or performance manipulation, offer a consistent explanation.

How much regression toward the mean should we expect if only noninformational effects were at work? Some clues can be found by looking at publicly quoted control firms that performed as well as our reverse LBOs before their offering. For each reverse LBO, we chose a comparison firm with a similar performance improvement in the preoffering year.[19] The performance of this comparison firm in the following year provides a benchmark measure for normal regression toward the mean.

We wish to test the following hypothesis:

H_0: *In the year after going public, reverse LBOs will perform as well as other firms with similar previous-year performance. That is, they will exhibit normal regression toward the mean.*

The alternative hypothesis is:

H_1: *In the year after going public, reverse LBOs will perform worse than other firms with similar previous-year performance. This suggests either some manipulation of performance (hidden action) or a decision to go public on the basis of private information (hidden information).*

We compare the average postoffering year performance of reverse LBOs and comparison firms. Reverse LBOs performed worse: the mean difference in $[\Delta OI/AT]$(IPO year + 1) was 2.21 percent, with a p-value of 10.4 percent

[19] The selection procedure was as follows: we put the reverse LBOs in alphabetical order. For the first half (or second half) we picked the firm in the same four-digit SIC code that had a $[\Delta OI/AT]$ closest above (or closest below) that of the reverse LBO in the year before the IPO. In the first half, there were nine cases in which such a matched firm did not exist. In the second half, there were two. For these cases, we chose as a matched firm the firm that had a $[\Delta OI/AT]$ closest (without regard to direction) to that of the reverse LBO in the year before the IPO (again in the same four-digit SIC code).

on a Wilcoxon test. We interpret this finding as consistent with the presence of informational effects.[20]

C. Debt Overhang

Because of the lack of hard, accessible data, it is difficult to test whether debt overhang induced the better-performing firms to go public (and prevented the worse-performing from doing so). Only a few of our reverse LBOs had issued public debt before they went public again, so that debt ratings—relating to privately held debt—are not available. Among the 40 reverse LBOs reported by *Going Public*: *The IPO Reporter* for the first nine months of 1991, four had debt-rating information on COMPUSTAT (Table IV). The table suggests that these firms went public even though their debt carried significant risk.

For reverse LBOs outside our sample, there is some anecdotal evidence that an IPO leads to a transfer from the equityholders to the debtholders. Consider the case of Amphenol, a company that underwent an LBO in 1987 and went public in 1991. Amphenol's junk bonds soared on the announcement of the IPO. This example is ambiguous, however, since it also suggests that a company with risky debt outstanding may go public anyway.[21] When reverse LBOs are backed by powerful specialists such as Kohlberg, Kravis, and Roberts (KKR), they may be better able to renegotiate terms with bondholders. A recent example is the Owens-Illinois reverse LBO, in which KKR forced banks to content themselves with low fees to compensate for the recapitalization. KKR's bargaining power may have resided in the banks' desire to maintain their relationship with the well-known LBO specialist. Or this may have been an example of the Coase Theorem in operation. (However, neither Coase nor KKR may be sufficient to secure new equity capital if an LBO, such as Macy's, teeters near bankruptcy.)

"Strip financing" was a widespread practice in the LBOs of the early 1980s, the group to which our reverse LBOs belong, and this should have facilitated the bargaining process between equity owners and debtholders. On the other hand, Kaplan and Stein (1991) report that the use of strip financing declined in later LBOs, suggesting that any selection effect due to debt overhang may be stronger in more recent reverse LBOs.[22]

[20] A regression analysis, not reported, revealed that the link between pre-IPO and post-IPO performance differed between reverse LBOs and comparison firms. A regression of $[\Delta OI/AT](IPO+1)$ on $[\Delta OI/AT](IPO)$ yielded a negative slope for reverse LBOs, and a positive one for comparison firms. The difference in slopes was significant at the 5 percent level.

[21] Amphenol bought back a fourth of its junk bonds—at 70 cents on the dollar—just before it announced the IPO, suggesting that if debt overhang is a potential problem it can be at least partially circumvented. Needless to say, those bondholders that sold were not pleased by the subsequent IPO announcement. See "Heard on the Street," *Wall Street Journal*, September 17, 1991.

[22] "Strip financing" is present when senior claimants on the LBO also hold junior claims, such as equity.

Table IV
Standard and Poor's Bond Ratings of Four Reverse LBOs that Went Public in 1991
Rating is given for quarter preceding the IPO.

Reverse LBO	Bond Rating
Carlisle Plastics	B
Cherokee	C
Duracell	B
Owens-Illinois	B+

Finally, it is not clear that strong LBO performance is necessarily associated with less-risky debt—a necessary link if debt overhang is to create a selection effect. To test whether this link is present, we examine all the LBOs currently listed on COMPUSTAT for which bond ratings and recent performance data are available.[23] We compare the bond rating for the first quarter of 1991 and $\Delta OI/AT(1990)$. The Kendall rank correlation coefficient is 0.178, with a z-statistic of 1.45, suggesting that the correlation, although present, is not significant at conventional confidence levels.[24]

To conclude, it seems unlikely that a selection effect due to debt overhang is a primary explanation for the strong performance of reverse LBOs in the year before going public. The association between debt risk and recent performance gains is weak, and the mere fact that their debt is risky need not prevent LBOs from going public.

D. Other Possible Explanations

D.1. Lost Incentives

While these findings are consistent with the mechanisms presented in Section II, one might wonder whether they are not simply the results of other effects. One possibility is that managers' incentives are altered in the course of the IPO. According to Jensen (1989, p. 61), LBOs resolve the "central weakness of the public corporation, the conflict between managers and shareholders." Under an LBO, incentives are aligned both through management ownership (which ensures that managers are appropriately rewarded or penalized for their actions) and through debt financing, because heavy debt service obligations prevent managers from investing in projects with negative present value. If going public alters one or both of these mechanisms, our results may simply show that the enterprise has returned to the traditional form of corporate governance and suffered its associated agency problems.

[23] COMPUSTAT has a code for LBOs, which allowed us to identify 68 firms currently under the LBO form. Of these, 33 had 1989 and 1990 performance data available, as well as bond ratings. We restricted our analysis to bond ratings, rather than prices, because prices are difficult to obtain for bonds not traded on public exchanges.

[24] Further analysis showed that even strong recent gains in performance did not result in significant (economically or statistically) *changes* in debt ratings.

It is not clear, however, that managers' incentives are significantly diminished by a reverse LBO. They remain exceptionally powerful. Management's ownership stake remains high even after the reverse LBO, and the firm's indebtedness, although in general reduced in the course of a reverse LBO, remains quite substantial.[25] Most reverse LBOs mention debt reduction (in various forms) as a motivation for the equity offering,[26] but the goal may be to reduce *excessive* debt, not to escape the discipline of debt altogether. Moreover, it is unlikely that either present owners or investors would be attracted by a transaction that significantly relaxed a beneficial discipline. In short, the lost incentives hypothesis does not offer a convincing explanation for the disappointing performance of reverse LBOs.

D.2. Change in Strategy

Another potential interpretation of our results is that after going public again, LBOs alter the tradeoff rate between current and future cash flows. Before the IPO, they are forced to cut costs by their heavy debt load. This focus on current cash flows leads them to shun certain expenses, such as R & D or marketing, as well as capital expenditures that will only yield rewards far in the future. Once the IPO relieves them of this debt pressure, they are again able to spend on these items. Capital expenditures might rise, leading to an increase in depreciation which would hurt operating income after depreciation, our measure of performance.

We examined capital expenditures of reverse LBOs in the preoffering and postoffering years. For neither year are changes in capital expenditures for reverse LBOs significantly different than for control firms, and changes in capital expenditures for reverse LBOs are not significantly different from the preoffering to the postoffering year.[27] We also replicated the tests of Table III using operating income before depreciation as our measure of performance, with qualitatively similar results.

Were this "cash flow rebalancing" hypothesis to hold, one would expect that the performance reversal should be correlated with the amount of deleveraging. Such a relationship was not present in our data. One explanation may be

[25] In our sample, officers and directors owned collectively a median 72.3 percent of the equity of their firm before the initial public offering, and 49 percent after the equity offering. As a benchmark, Morck, Shleifer and Vishny (1988) report that, for a sample of 1980 Fortune 500 firms, the mean combined stake of all board members was 10.6 percent (median 3.4 percent).

Muscarella and Vetsuypens (1990) report the following median leverage values:

Pre-LBO accounting leverage:	43.2 percent
LBO market leverage:	93.4 percent
Pre-IPO accounting leverage:	78.6 percent
Post-IPO accounting leverage:	55.5 percent

[26] All but 5 of the 62 reverse LBOs in our sample listed debt reduction as one of the main (or the only) uses for the proceeds of the IPO.

[27] Earlier LBO studies show that LBOs tend to reduce capital expenditures (Smith (1990)). Given our results, this reduction presumably occurs in the early stages of the buyout period. These studies also indicate that LBOs do not appear to skimp on R & D or marketing at the expense of future earnings.

that the presence of outside shareholders after the IPO induces pressure for short-term results that substitutes for the debt constraint.

V. Stock Price Performance

How (if at all) does the disappointing operating performance of reverse LBOs translate into stock price movements? Recent evidence presented by Ritter (1991) and Chu (1989) indicates that in the long run the stock market turns out to be disappointed by IPOs—suggesting that on average IPOs may well be overpriced rather than underpriced. Both authors investigate horizons of several years. Because most reverse LBOs are recent, data limitations force us to look at a two-year horizon.

We wish to assess the following null and alternative hypotheses:

H_0: *Although the operating performance of reverse LBOs is disappointing, the market understands this process. Hence stock prices of reverse LBOs will exhibit normal performance on average.*

H_1: *The disappointing operating performance of reverse LBOs is insufficiently anticipated. Hence stock prices of reverse LBOs will exhibit poor performance on average.*

Our results are summarized in Figure 2.[28]

Finding 5: Reverse LBOs' stocks do not underperform comparison firms over a two-year horizon after the IPO. In fact, they outperform them: the two-year cumulative average excess return is 15.22 percent. The *t*-statistic, however, is 1.41, indicating that the difference in performance is not statistically significant. The variability in the sample is such that superior performance would be difficult to establish statistically.[29]

In his study of the long-run performance of IPOs, Ritter (1991) finds that IPOs underperform comparison firms on average, although large IPOs exhibit normal performance. Since reverse LBOs are much larger than the typical IPO, our results are consistent with his.

In a study of the stock price performance of spinoffs, Cusatis, Miles, and Woolridge (1991) find that they significantly outperform various market indices over a three-year period. It could be that our sample of reverse LBOs is a mixture of firms that are part large IPOs and part spinoffs, which would

[28] Data were obtained from the Center for Research in Security Prices data tapes. The methodology is the same as in Ritter's 1991 study, to which we refer the reader. We used the same control firms here as in the earlier sections. We also compared the terminal payoffs of buy-and-hold portfolios of reverse LBOs vs. control firms, with similar results.

[29] Excess performance might have proved significant in a larger sample. How might this have arisen? Reverse LBOs were a new phenomenon. It is hard to get the pricing right with relatively little experience. Moreover, arbitrageurs may have been hesitant to take on uncertainties (as opposed to risks), particularly since the time to payout could be significant. Holthausen and Larcker (1992) find a similar pattern to post-IPO stock price performance for a sample period of 48 months.

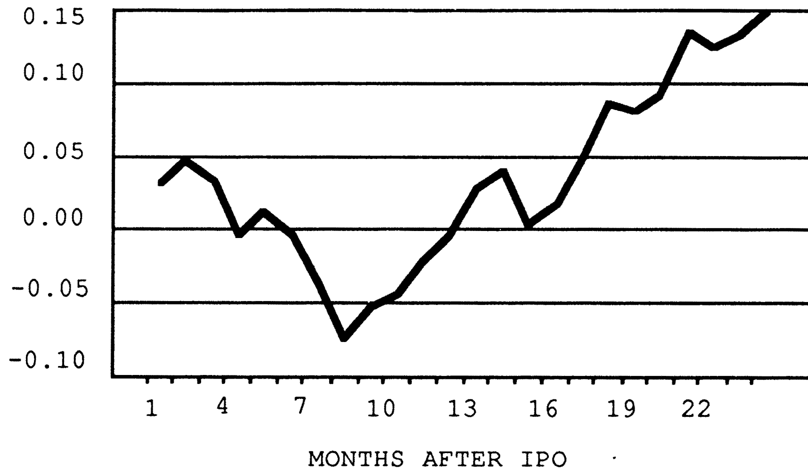


Figure 2. Cumulative average excess returns for an equally weighted portfolio of 62 reverse LBOs that went public between 1983 and 1987, with monthly rebalancing. Excess returns were computed by subtracting a benchmark return, defined as the return on a matching firm. Matching firms are identical to those used for the study of operating performance. Matching firms delisted during the first 24 months after the reverse LBO went public were replaced for the remainder of the period by another matching firm, using the same selection process. For each reverse LBO, the matched control firm was chosen by selecting the next firm in alphabetical order in the COMPUSTAT list of firms in the same four-digit SIC category, provided that operating performance data were available for the relevant years and that its assets were between 50 and 200 percent of those of the reverse LBO. The size filter was set aside if it was not satisfied by any firm in the same four-digit SIC code.

explain our finding of positive but not statistically significant abnormal stock price performance.

We also find—consistent with previous studies—that reverse LBOs are subject to short-run underpricing, in the sense that they experience (economically and statistically) significant gains in the first trading day (2.60 percent, t-statistic 2.50).

Our findings indicate that the market is not surprised by the pattern of performance before and after the IPO. This suggests that reverse LBOs are more correctly priced at the time of the offering than the average IPO, which rises by more than 10 percent on average on the first day (Ritter (1984)), but underperforms in the long run (Ritter (1991)).

VI. Implications

A. LBO Performance

Although our main concern is with information asymmetry, behavioral decision, debt overhang, and their implications for the performance of IPOs, our findings also contribute to an understanding of leveraged buyouts. LBOs have been the subject of intense debate. Do buyout premiums reflect real operating improvements? Kaplan (1989) and Smith (1990) find that operating performance improves significantly after an LBO. Our findings and hypotheses have implications for previous LBO studies, which (for data availability reasons) used samples containing a large proportion of reverse LBOs. Earlier studies addressed the issue of potential selection bias: are reverse LBOs a small, special category of LBOs, or can one generalize from them to all LBOs? Since recent evidence indicates that a very large proportion of LBOs go public again (Kaplan (1990)), this may well be a nonissue.

On the other hand, inasmuch as earlier studies implied that the performance gains experienced before the IPO could be sustained afterward, they gave too much weight to the good performance of the pre-IPO year: it should have been combined with the following year performance, which we have shown to be disappointing. The real bias of earlier LBO studies may not have been in the selection of the firms in the sample, but rather in the choice of the period of observation. This problem of sample period bias has not commonly been recognized.

Holthausen and Larcker (1992) focus on the absolute level of performance (they consider changes only in the post-IPO period, whereas we focus on changes in performance before and after the IPO event). They find that reverse LBOs exhibit higher returns on assets and operating cash flows than their industry, both before and after the IPO. They report weak evidence of deterioration in the post-IPO period (their Table V). They suggest that reverse LBOs are strong firms relative to their industry, a finding consistent with ours.

B. The Transition from Private to Public Ownership

Taken together, our hypotheses and findings are consistent with one possible story for the transition from private to public ownership. Pure selection effects—behavioral effects and debt overhang—would induce LBOs to wait for an exceptionally good year to go public again.[30] As a consequence of these pure selection phenomena alone, reverse LBOs would be disproportionately good performers before the IPO, and their performance would regress toward the mean subsequently. Deterioration in performance is greater than the behavioral or debt overhang hypotheses can explain, and information asymmetry provides a consistent explanation for this pattern. Perhaps the firm has a year that is not only exceptionally good, but uncharacteristically good relative to privately discernible future prospects. The managers (together with the LBO specialists) make plans for taking the firm public. At this point they begin to work even harder, to make the company look even better to investors. (Their own dollars are at stake, and each dollar of incremental earnings will be magnified by the marginal price-earnings ratio.) They may also defer expenses and borrow future sales (even if the

[30] Buyers may behave according to prospect theory, sellers may be subject to the "disposition effect." Large risky debt loads may prevent poorly performing LBOs from going public.

long-term effect may hurt the company).[31] After the firm goes public, it will not perform as well for three reasons: (1) previous performance has been tilted, (2) the year following an exceptional one is likely to be less impressive, and (3) the unimpressive prospects foreseen by management are likely to materialize.

C. Related Problems

The phenomena we discuss relate to a wide range of selling situations in which information is asymmetric and the item is offered at a time chosen by the seller. The owner of an undeveloped piece of land tries to sell it after a building deal falls through, a deal potential buyers will not know about but can possibly infer. In a phenomenon that parallels earnings manipulation, sellers of houses frequently repaint the inside to suggest that it has been well maintained, even though they know that the buyer will prefer her own color scheme, and that the ploy will be recognized. In today's depressed real estate markets, behavioral effects reveal themselves: transferred homeowners incur the inefficiencies of renting their old houses, waiting for the market to come back.

VII. Conclusion

In the period before going public, reverse LBOs substantially outperform comparison firms. In the following period, they underperform them, although the net performance remains positive. This pattern of performance is predicted by models of information asymmetry between owners and the market. Consequences of debt overhang and behavioral decision making by sellers or

[31] Managers of LBO firms also have particular incentives to manipulate accounting numbers at the time of going private. By understating the true value of the company, as substantial purchasers of stock, they might stand to get a better deal for themselves. However, contrary to this hypothesis, DeAngelo (1986) finds that managers do not systematically pump down earnings before a buyout. Her finding makes our results all the more striking. If earnings are hard to deflate, one might think that if anything they would be harder to inflate. (To inflate earnings, an outside party has to forego a receipt, pay more, or buy earlier.) But our results suggest that significant inflation of earnings does take place before the reverse LBO's IPO.

Perhaps checks on management are stronger at the buyout stage, possibly because of the element of coercion present in that situation. A smart stockholder of a company going private who suspects downward manipulation of earnings does not have a fairly priced "exit" option, but he can exercise his "voice" option, say by suing the management. (In contrast, a smart investor who figures out the manipulation of performance at the time of an IPO always has the exit option of not buying. Besides, since no fiduciary responsibility has been breached, the prospects for a successful lawsuit are limited.) In this light, DeAngelo's evidence suggests that it is not an equilibrium strategy for management to understate performance at the time of the buyout and then bear the consequences of a lawsuit. Our evidence, for public offerings as opposed to going-private transactions, indicates that it may well be an equilibrium strategy for management to overstate performance at the time of the IPO, even though the market may decipher the manipulation. Indeed, to the extent that such manipulation will be expected, pumping up earnings seems both inevitable and rationalizable, and possibly justifiable.

buyers would contribute to these phenomena. The aftermarket performance of reverse LBOs suggests that the market is not fooled.

Appendix

In this appendix we justify the manager's decision rule for the model of Section II, and we derive the equation of the "cutoff curve."

A. Claim

The managers will base their decision on the rule: "Sell at the end of period 1 if $x > h(\mu)$, where h is some upward-sloping function to be determined (the "cutoff curve"); otherwise sell in period 2."

To see this, consider a manager who is indifferent between selling and waiting at the end of period 1. Other things equal, a higher μ makes waiting more attractive, but does not affect the payoff to selling. Keeping μ constant, a higher x increases the payoffs to both selling and waiting. However, the payoff to waiting is increased less than that of selling, because of β, and because any effect of x on $E[s(x, z)| \mu, x]$ (the manager's period 1 expectation of the market's Bayesian valuation of the firm in period 2) is mitigated by z. In the (μ, x) space, the quadrant northwest from the indifference point is thus a selling region; the southeast quadrant is a waiting region. This justifies the decision rule and shows that the $h(\mu)$ cutoff curve is upward sloping.

B. Cutoff Curve

If the manager sells in period 1, then it must be that $\mu < h^{-1}(x)$. The market's posterior distribution of expected per-period earnings is then:

$$g[\mu | x; \mu < h^{-1}(x)] = \frac{p(\mu) f(x; \mu)}{\int_0^{h^{-1}(x)} p(\mu) f(x; \mu)\, d\mu}$$

The market pays:

$$s(x) = m \frac{\int_0^{h^{-1}(x)} \mu p(\mu) f(x; \mu)\, d\mu}{\int_0^{h^{-1}(x)} p(\mu) f(x; \mu)\, d\mu}$$

Similarly, if the manager sells in period 2, then $\mu \geq h^{-1}(x)$. In this case, the market's posterior distribution of earnings is:

$$g[\mu | x, z; \mu \geq h^{-1}(x)] = \frac{p(\mu) f(x; \mu) f(z; \mu)}{\int_{h^{-1}(x)}^{\infty} p(\mu) f(x; \mu) f(z; \mu)\, d\mu}$$

The market pays:

$$s(x,\, z) = m \frac{\int_{h^{-1}(x)}^{\infty} \mu p(\mu) f(x;\, \mu) f(z;\, \mu)\, d\mu}{\int_{h^{-1}(x)}^{\infty} p(\mu) f(x;\, \mu) f(z;\, \mu)\, d\mu}$$

We now assume that earnings are uniformly distributed over $(0,\, 2\mu)$. (This implies that $\mu \geq x/2$.) The expressions for $s(x)$ and $s(x,\, z)$ become:

$$s(x) = m \frac{\int_{x/2}^{h^{-1}(x)} \mu p(\mu) \frac{d\mu}{\mu}}{\int_{x/2}^{h^{-1}(x)} p(\mu) \frac{d\mu}{\mu}} \quad \text{and} \quad s(x,\, z) = m \frac{\int_{h^{-1}(x) v (z/2)}^{\infty} \mu p(\mu) \frac{d\mu}{\mu^2}}{\int_{h^{-1}(x) v (z/2)}^{\infty} p(\mu) \frac{d\mu}{\mu^2}}$$

where $h^{-1}(x) v(z/2)$ designates $\max[h^{-1}(x),\, z/2]$.

Assume now that $p(\mu) = K\mu^2 e^{-\mu}$, for some constant K $(0 \leq \mu \leq \infty)$. Then:

$$s(x) = m \frac{\int_{x/2}^{h^{-1}(x)} \mu^2 e^{-\mu}\, d\mu}{\int_{x/2}^{h^{-1}(x)} \mu e^{-\mu}\, d\mu} \quad \text{and} \quad s(x,\, z) = m \frac{\int_{h^{-1}(x) v (z/2)}^{\infty} \mu e^{-\mu}\, d\mu}{\int_{h^{-1}(x) v (z/2)}^{\infty} e^{-\mu}\, d\mu}$$

By integration by parts:

$$\int \mu e^{-\mu}\, d\mu = -\mu e^{-\mu} + \int e^{-\mu}\, d\mu = -\mu e^{-\mu} - e^{-\mu}$$

$$\int \mu^2 e^{-\mu}\, d\mu = -\mu^2 e^{-\mu} + 2 \int \mu e^{-\mu}\, d\mu$$

Suppose that $x = h(\mu)$, so that the manager is indifferent between selling and waiting. Writing $y = x/2$ and $w = z/2$, we get:

$$s(x) = 2m + m \frac{\mu^2 e^{-\mu} - y^2 e^{-y}}{(\mu + 1) e^{-\mu} - (y + 1) e^{-y}}$$

$$s(x,\, z) = m(1 + \mu v w)$$

It is easily verified that: $E_z[s(x,\, z) | \mu,\, x] = m(1 + \mu)$.

Equation (1) now becomes:

$$2m + m \frac{\mu^2 e^{-\mu} - y^2 e^{-y}}{(\mu + 1) e^{-\mu} - (y + 1) e^{-y}} = \beta\mu + \beta m(1 + \mu). \tag{2}$$

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