

The Crash of the Revco Leveraged Buyout: The Hypothesis of Inadequate Capital

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■ On July 28, 1988, Revco Drug Stores filed for bankruptcy in what is arguably the most notable failure in the annals of highly leveraged transactions. The firm collapsed merely 19 months after going private, a life span astonishing for its brevity. At closing in December 1986, the leveraged buyout (LBO) was one of the largest ever (\$1.4 billion) and, featuring nine discrete layers of securities in the capital structure, was certainly one of the most complex. At bankruptcy, Revco gained distinction as the first "megafailure" among LBOs, a leader in what is by now a long line of prominent collapses, including Campeau (Allied/Federated), Integrated Resources, Ames Department

Stores, Circle K, Hillsborough Holdings, and Greyhound. On December 17, 1990, the court-appointed U.S. Bankruptcy Examiner opined that the Revco case revealed "viable causes of action . . . against a broad panoply of defendants under fraudulent conveyance¹ and other legal theories" (Zaretsky [24, p. 3]). Notable in the panoply were Revco's financial advisors, and their inclusion was an

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¹In the law (i.e., the Bankruptcy Code, the Uniform Fraudulent Conveyance Act (UFCA) and its successor, the Uniform Fraudulent Transfer Act (UFTA)), a fraudulent conveyance is a transfer of property the object of which is to defraud or delay an unsecured creditor or alienate the property from his reach. Where courts find fraudulent conveyance, the liens and security interests of the secured lenders may be set aside and collateral subordinated to the unsecured lender. In the Revco case, the examiner considered the financial advisors, accountants, bank lenders, and even shareholders as possible targets of attack under the theory of fraudulent conveyance.

unprecedented extension of the doctrine of fraudulent conveyance.

Perhaps the most arresting aspect of this case is the allegation made in the financial press,² and eventually by the bankruptcy examiner himself,³ that the leveraged buyout left Revco with an unreasonably small amount of capital. Showing that an LBO rendered a firm inadequately capitalized can be the acid test for applying the principle of fraudulent conveyance in a bankruptcy case.⁴ Therefore, the objective of this study is to test the hypothesis of inadequate capital by simulating the financial performance of the company, using financial data on Revco, and comparable companies, that was publicly available on the day Revco went private.

The simulation approach was motivated by Gordon Donaldson's classic application of simulation to corporate debt policy [6]. According to Donaldson, "The answer [about the financial survival of the firm] lies in the behavior of cash flows" [6, p. 164]. Thus, to test the hypothesis of inadequate capital, we tested whether Revco's debt service was too high by estimating means and variances of the major components of cash flow using historical data and forecasts for the industry and for Revco. The resulting model yielded an entire range of cash-flow scenarios and an implied probability of survival.

If the allegations by the bankruptcy examiner and others are simply *ex post* rationalizations, we would expect the simulations to produce a reasonably high probability of survival. On the other hand, if the simulations reveal a low probability of survival, the results would be consistent with the hypothesis of inadequate capital. Either way, the simulation approach has the virtues of harnessing the information available to analysts at the date of the buyout and casting that information into a probabilistic assessment of survival.

The study offers two principal findings:

(i) Viewed *ex ante*, Revco had an extremely low probability of successfully servicing its liabilities over the first three years after it went private.

(ii) When compared with historical performance information for Revco and other similar companies, the forecast

assumptions used by Revco's financial advisors were optimistic.

The failure of Revco Drug Stores stands as a provocative counterpoint to much of the previous academic research on LBOs ([2], [3], [4], [11], [12], [13], and [21]). These studies suggest that the LBO aligns the incentives of managers and shareholders, binds managers to deliver cash to investors, rationalizes internal organization, and reduces costs. Indeed, Revco's proxy statement cited these and other virtues as motives for the LBO,⁵ and the examiner's report suggested that some progress was made toward realizing these benefits. In a recent paper, Wruck [23] cited evidence that the investor group overpaid for Revco, but concluded that management's ineptitude was more likely to blame for Revco's failure than how the LBO was structured. With the aid of the simulation results, however, we contend that truly exceptional performance on the part of Revco management would have been necessary to avert the company's demise. Moreover, our conclusions are robust with respect to the assumptions of the parameters of the key variables in the simulation. The same simulation technique applied to Eckerd Drugs, a competitor of Revco that underwent an LBO at about the same time, gives a much higher probability of survival. The respective probabilities of survival for Eckerd and Revco are supportive of the simulation technique, as Eckerd has survived its LBO to date, while Revco has not.

I. The Demise of Revco

The buyout of Revco in 1986 consummated a long episode of anxiety for Sidney Dworkin, Revco's chief executive officer, about possible takeover threats, internal fighting over control of the firm,⁶ and declining financial

⁵The proxy statement issued the month prior to the LBO cited several reasons why the buying group regarded the purchase of Revco "an attractive investment opportunity": (i) the company's favorable business prospects, (ii) being private would permit Revco to have a higher debt-to-equity ratio than in the past and thus realize higher return on equity and higher growth in net worth; and (iii) the value of Revco depended on long-term expansion of the business rather than on quarterly results, to which public investors give undue attention.

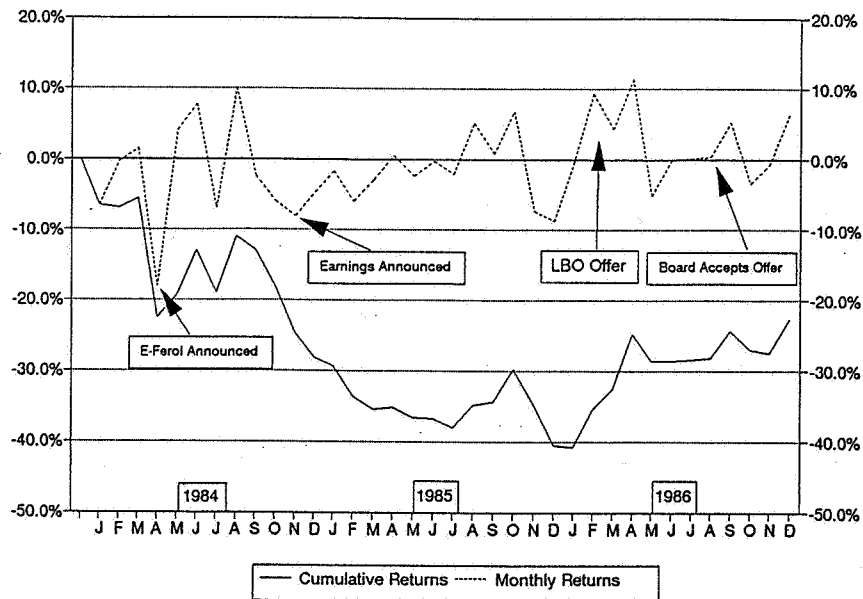
⁶CEO Dworkin had been concerned about possible takeover threats [24, p. 30] since April 1984, when the firm's stock price was battered by the sudden announcement by the Food and Drug Administration of a possible link between E-Ferol, a vitamin product, and infant deaths. In the week of the FDA announcement, Revco's market value of equity fell by \$160 million, more than twice the \$75 million liability that analysts estimated (see Jensen [10]). Dworkin, who owned 2.3% of the firm's common shares, had hoped to pass the reins of top management to his two sons, both of whom were senior vice-presidents of Revco. Within six days of the FDA announcement, Revco announced an agreement to acquire Odd Lot Trading, Inc., a retailer of close-out goods, in an exchange of shares;

²"Revco was in trouble from the day it went private. Sales and earnings projections were strictly from dreamland." [15, p. 46]

³The examiner wrote that "a basis may exist for a finding of insolvency [at the date of going private] and that a substantial basis exists for establishing that the Revco LBO left Revco with unreasonably small capital to conduct its business and meet its then known obligations." [24, p. 3]

⁴See Michel and Shaked [16] for a more detailed explanation of fraudulent conveyance as applied to LBOs.

Exhibit 1. Market-Adjusted Monthly Excess Returns for Revco Common Stock 1984-1986



performance.⁷ The performance of Revco's common stock over the period 1984-1986 provides a clear picture of how poorly the company performed prior to the 1986 LBO.

the transaction put 12% of Revco's new total shares in the hands of two of Dworkin's closest friends, Isaac Perlmutter and Bernard Marden, who were the owners of Odd Lot Trading and who would become officers of Revco.

The peace of mind acquired with Odd Lot was short-lived: in less than three months after joining the firm, Perlmutter and Marden found evidence of purchasing irregularities in the firm centering on Elliott Dworkin, one of Sidney's sons. A week later, Perlmutter and Marden announced that they might make a hostile tender offer for the firm, that they wanted 6 of 12 seats on the board of directors, and that they had retained Drexel Burnham Lambert to advise them. Shortly thereafter, the board largely exonerated the purchasing department; Perlmutter and Marden were fired in February 1985; their shares were repurchased by Revco in July 1985.

⁷For the five years up to 1984, Revco's sales had grown at a compound annual rate of 19%; earnings per share had grown at about 18%. The stock price had risen 60%, as compared with a 49% increase in the S&P 500 Index. Revco's stock price never recovered, however, from the E-Ferol controversy, the purchase of Odd Lot, and the ensuing management infighting. Nor was the stock price helped by a decline in the firm's financial performance in 1985 and 1986, when revenues grew, although at a comparatively slow rate, but operating profits declined, which was largely blamed on losses at the new Odd Lot subsidiary.

Exhibit 1 is a graph of monthly market-adjusted returns and cumulative market-adjusted returns⁸ (CMAR) for Revco during the period 1984-1986. Shareholders lost significant wealth over 1984-1985, as evidenced by the CMAR of -40% at the end of 1985. During 1986, the year of the buyout, shareholders recovered somewhat to an ending CMAR of -23.5%.⁹ The effects of several events are identifiable in Exhibit 1. The sharp drop in returns in April 1984 coincides with the government recall of E-Ferol, a vitamin E supplement produced by a Revco subsidiary. Analysts estimated that Revco's liability could amount to \$75 million; yet the drop in market value associated with this event was \$160 million. Further deterioration in returns later in 1984 is associated with the an-

⁸CRSP's equally weighted daily market index was transformed into a time series of monthly returns, which were subtracted from a corresponding series of monthly returns for Revco. The resulting monthly excess returns were cumulated to create the cumulative market-adjusted return series.

⁹To assess performance following the LBO, we collected prices for Revco bonds that were outstanding before and after the buyout. Unfortunately, the quality of the data make interpretation difficult, as only monthly prices were available and the bonds traded infrequently. The bond prices do not reveal any clear evidence of wealth transfers at the time of the buyout, but the price did fall steadily afterwards with the decline of the company.

nouncements of worse-than-expected financial performance. The declines in CMAR in February-March 1985 are associated with management changes and the removal of dissident directors. Later in 1985, additional declines are associated with worsening financial performance and the downgrading of Revco's debt ratings by the major rating agencies.¹⁰

An independent investment banker first proposed the idea of an LBO to Sidney Dworkin on September 17, 1985. Revco retained Salomon Brothers, Inc., shortly thereafter to advise on the feasibility of an LBO. Salomon rationalized Revco's poor recent financial results as being the result of "temporary problems" [24, p. 36]. Wells Fargo Bank met with Salomon and Revco management on January 24, 1986, to develop a syndicate of banks to provide senior debt in the transaction, and the bank provided a commitment letter in early March 1986.

On Tuesday, March 11, 1986, Dworkin presented a proposal for an LBO to the Revco directors. The proposal called for shareholders to receive \$33.00 per share in cash and \$3.00 per share in exchangeable preferred, a 17.6% premium over the previous Friday's closing price on the New York Stock Exchange. The LBO announcement produced a two-day (Monday and Tuesday) market-adjusted return of 8.4%. Dworkin's announcement generated a vigorous debate within the financial community regarding the adequacy of the bid,¹¹ which eventually led him, on June 2, 1986, to present a revised offer to the board of \$38.50 in cash. The directors accepted the offer on August 15th, and Revco stockholders voted to approve the acquisition on December 17, 1986. Revco was taken private on December 29, 1986, at a 48% premium over the firm's stock price 12 months earlier and a 71% premium over the price at which Revco repurchased shares in July 1985.

Through the summer and fall of 1986, Revco's management watched the performance of the firm fall short of budget. Net income for the year that ended May 31, 1986, was down 17.6% from the previous year. During the first

¹⁰Performance deteriorated in 1985 because of unsuccessful price-discounting programs, significant store relocation and remodeling expenses, turmoil in the purchasing department, legal fees associated with the dissident directors, and losses associated with an unsuccessful division.

¹¹Two securities analysts, issuing separate reports, believed the offering price to be "fair" [20]. Other analysts believed the bid to be *too low*: William Blair & Company issued a report [15] saying that "\$38-40 is more equitable." Also, the Dart Group, operator of a chain of discount drugstores, approached the directors about a possible acquisition of Revco. Later, Dart asked to join the LBO group and threatened to mount a hostile tender offer if excluded. Jamie Securities, a risk-arbitrage boutique, expressed an interest in raising its holding of Revco shares to more than the 9% it already owned.

Exhibit 2. Revco Operating Income (in \$ Millions) by Quarter for Fiscal Year 1987

	Original Budget	Revised Budget	Actual Results
First quarter (June - Aug. 1986)	\$24.5	\$19.1	\$19.1
Second quarter (Sept. - Nov. 1986)	39.9	24.7	24.6
Third quarter (Dec. 1986 - Feb. 1987)	68.4	66.4	34.7
Fourth quarter (Mar. - May 1987)	56.0	60.8	50.7
Year	\$188.9	\$171.0	\$129.1

Source: Zaretsky [24].

quarter of fiscal 1987, June-August 1986, operating income was 21.8% lower than plan. Management attributed the poor results to the entry of new discounters into the discount-drug retailing industry. In October 1986, the operating budget was revised to provide a forecast for use in the prospectus for the LBO's subordinated notes, the proxy statement to shareholders, and the solicitation statement for old debt holders. As indicated in Exhibit 2, however, even the revised budget was well above Revco's actual performance for fiscal 1987. An internal memo written by Revco's treasurer and dated January 2, 1987—four days after the LBO closed—expressed serious concerns about the firm's worsening cash flows:

I am very concerned about cash flow since the sales for the past six weeks have been poor resulting in approximately \$30 million less cash flow. It will be very difficult to make up this loss of funds. In fact, we have no excess cash going forward. [24, p. 199]

The reports for the four-week and 32-week periods ending January 10, 1987, showed an extremely disappointing Christmas season. What followed was a progressive financial asphyxia that prompted Revco's anxious bankers to meet with the company in February and March.

On March 31, 1987, the banks were informed that Dworkin would step down as CEO (although he would remain board chairman), a move that reflected the sentiments of the banks and Salomon that Dworkin "was more entrepreneurial and not experienced or capable of running the operations on a day-to-day basis in a highly leveraged environment" [24, p. 133]. At this same meeting, the

banks were informed that progress on asset sales had been delayed, operating income was running below budget, and inventories were over plan. By May 1987, the end of the fiscal year, the situation was such that Revco's new chief financial officer at the time would later state that he believed the firm "was in serious danger of not being able to make debt service payments due in May" [24, p. 137].

On September 25, 1987, Sidney Dworkin agreed to sever his relationship with Revco in return for a repurchase of his stock at the price at which he had invested in the LBO, even though the firm had deteriorated in the preceding nine months. Boake Sells, former CEO of Dayton Hudson, took over Dworkin's position. Because of various cash-flow problems, the firm was unable to obtain inventory necessary to stock the stores for the December 1987 Christmas season. As a result, stock-outs were especially severe, and up to 20% of the appropriate inventory was not available in stores.

On March 10, 1988, Salomon's high-yield-bond sales force stopped making a market for Revco's debt securities. Twelve days later, Salomon deleted Revco from its monthly report, "The Safest of High Yields." At the same time, Boake Sells met with Salomon and expressed his displeasure with the level and quality of Salomon's advisory services.

On April 13th, Salomon presented a restructuring proposal to Revco. Sells rejected it, and after soliciting restructuring proposals from other firms, Revco retained Drexel Burnham Lambert on April 19th to devise a restructuring plan.

On June 16, 1988, Revco missed its first interest payment and omitted a quarterly preferred stock dividend. Drexel appealed to the firm's investors to grant Revco "breathing room." When these appeals were rejected, the firm filed for bankruptcy on July 28, 1988.

II. The Hypothesis of Inadequate Capitalization

To prove fraudulent conveyance in the failure of a leveraged buyout, plaintiffs must establish two points. First, they must argue that the firm never received "reasonably equivalent value" from secured lenders in return for giving them a security interest; i.e., that the funds went directly from the lender to the selling shareholders, thus burdening the firm to the detriment of its unsecured creditors. Michel and Shaked [16, p. 43] have argued that this requirement is virtually always met by the structure of the LBO transaction. Second, the plaintiffs must show that, as a result of the LBO, the firm was (i) left insolvent, or (ii) left with "unreasonably small capital."

The test of insolvency considers whether the sum of liabilities at the date of the LBO was greater than the value of the firm's assets. Regarding this test, Wruck [23] concluded: "Assuming the data from Eckerd's LBO provide the best value estimate, it appears the investor group paid somewhere between \$200 and \$350 million too much for Revco" [23, p. 86]. Kaplan reported a median premium of 42.3% for a sample of 76 management buyouts completed in the period 1980-1986 (see Kaplan [13, Table 2]) and 38.7% for 15 MBOs in 1986 (see Kaplan and Stein [14, Table 1]). For Revco, the premium equalled 48% over the early 1986 price and 71% over the July 1985 price. The examiner concluded¹² that "it appears that under most tests Revco would have been solvent, although not in all cases" [24, p. 171]. We argue that the asset valuation required by the solvency test is technically quite difficult and prone to error in the instance of Revco. Instead, we focus on the test of "unreasonably small capital," i.e., whether the LBO rendered the firm incapable of continuing its business and meeting its financial obligations as they became due.

The examiner listed a number of qualitative facts in support of the hypothesis that the Revco deal was economically unattractive. First was insufficient demand by the lenders for the deal: of 33 banks invited to participate in the syndicate, only 11 actually did. Because the initial round of commitments was insufficient to finance the deal, fees to the banks had to be increased to induce them to step up their lending commitments. Second, the appraised asset value of Revco was less than the purchase amount under certain assumptions. Third, although other bidders were rumored to be preparing offers, in fact none appeared to top Dworkin's bid. Fourth, Moody's and Standard & Poor's, the rating agencies, declared Revco's LBO to have a "negative outlook" more than a month before the deal was consummated. Fifth, internal bank memoranda acknowledged that the firm would survive only with aggressive asset sales. And finally, the performance of the firm had been declining to the point, in the fall of 1986, of necessitating a rebudgeting of fiscal year 1987.

In addition to the qualitative evidence, the examiner's report cited financial analyses prepared by Midland Bank and Alex. Brown & Sons as quantitative support of the inadequate capitalization hypothesis. A "reasonable case"

¹²The examiner retained Alex. Brown & Sons to perform a solvency analysis comparing the par value of liabilities to the market value of assets—where market value was determined under three different approaches: comparable market multiples, comparable merger multiples, and discounted cash flow. The challenges in this analysis included the selection of comparable companies, scientifically estimating a discount rate, and accounting for the uncertainty about forecast assumptions.

scenario prepared by Marine Midland Bank¹³ led the examiner to conclude that Revco would be unable to meet its cash requirements starting in 1989. Further scenario analysis by Alex. Brown & Sons projected financial difficulty in 1988, 1989, and 1990, which prompted the examiner to conclude that "a strong case can be made that Revco was left with unreasonably small capital as a result of the Revco LBO" [24, p. 196].¹⁴

From a financial economic point of view, however, the formal analyses and other evidence provided by the examiner leave much to be desired. The discounted-cash-flow (DCF) method of valuation was the primary method used by the examiner to test for insolvency. Applying the DCF technique to a highly levered transaction is difficult to do correctly, however, because of an inherent simultaneity problem: the market value of equity is needed to compute the cost of equity, which, in turn, is needed to compute the market value of equity.¹⁵ The examiner's report does not disclose how this simultaneity problem was addressed. Moreover, even if the analysis is done correctly, comparison of values of assets and debt at the date of going private sheds no light on the timing, probability, or severity of default at some date in the future. In other words, if any test of insolvency or inadequate capitalization is to be informative, it must embody the uncertainty surrounding the forecast assumptions in a meaningful manner. The examiner's report strives to incorporate uncertainty through scenario analyses. The various scenarios considered leave the reader with no appreciation for the likelihood of default, however, and it is the prospect of default, not a few expected values, in which the creditors, management, and equity investors should be interested.

The only academic research specific to Revco was conducted by Wruck [23]. Although citing evidence that

¹³Marine's "reasonable case" assumptions were sales growth varying from 7.0 to 6.5% over five years, and *EBDIT* margin (earnings before depreciation, interest, and taxes divided by sales) ranging from 5.0 to 7.5% [24, p. 178].

¹⁴At one point in the report, the examiner reaches a contradictory conclusion. Based on an analysis of debt-service coverage performed by Alex. Brown & Sons, using a base-case scenario of 12% revenue growth and 7.7% *EBDIT* margin, the examiner concluded that Revco "appears to have adequate (emphasis added) capital" [24, p. 177]. This is the only passage in the report that is inconsistent with the examiner's overall conclusion that Revco was undercapitalized.

¹⁵As the debt is paid down in an LBO, the cost of equity must be recomputed to reflect the reduction in financial leverage. One possible escape from this simultaneity problem is to use the value of the actual equity investment as the basis for cost-of-capital estimation. This approach assumes that the dollar outlay equals the market value of equity, which, of course, may not be true. Moreover, it provides no clue as to how the market value of equity will evolve over time.

the Revco LBO was overpriced, Wruck also argued that the financial obligations could have been met were it not for the poor performance of Salomon in executing the disposition of certain assets. To illustrate her point, Wruck reported that, based on management's forecasts, only six percent of the assets needed to be sold to service the scheduled interest and principal payments for the first year of the LBO (see Wruck [23, Table 2]). We take exception to Wruck's calculations, however, because she omits \$87.5 million of principal payment due on the term loan in the first calendar year.¹⁶ With the inclusion of this payment, Wruck would have concluded that 44% (60% on the basis of actual results) of the total asset sales were necessary for Revco to survive the first year. More fundamentally, however, we take Donaldson's [6] position that point estimates for a single year cannot be used to assess survival probabilities accurately over a period of years. Only by considering all the moments of the components of cash flow and the cumulative effects of successive years of obligations can we hope to interpret accurately coverage ratios such as those reported by Wruck [23]. In addition, both Wruck and the examiner leave important questions unanswered about the timing, probability, and severity of a default. The answers to these questions offer better insight into the adequacy and reasonableness of the buyout. Thus, we address the examiner's allegation of inadequate capitalization as a testable hypothesis using simulation analysis.

III. A Simulation Approach to Estimating Revco's Probability of Default

Following Donaldson's [5] illustration of Monte Carlo simulation as applied to the evaluation of cash-flow adequacy, we use Monte Carlo simulation to test the ability of Revco to cover its annual cash obligations; in particular, we use the technique to yield an estimate of the probability of successfully covering the firm's cash interest, debt principal, and preferred dividend payments over the first three calendar years following the buyout. At issue is the sensitivity of the probability of survival based on variations in the operating assumptions used by Revco and

¹⁶As reported in Exhibit 3, Revco owed a total of \$132.5 million in principal payments for the first year following the buyout. Wruck [23] reports only the first payment of \$45 million being due. Her error no doubt arose from the fact that \$45 million was due in Revco's fiscal year, which ended on May 31, 1987, five months following the buyout. The first full calendar year after the buyout included an additional \$87.5 million of principal due on the term loan. Wruck also omits \$10.2 million of preferred dividends, which we include as part of the firm's financial obligations.

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Salomon versus assumptions consistent with the historical performance of comparable companies and Revco.

A. The Variables

The simulation model forecasts a cash-flow debt-service coverage ratio ("CF Coverage") for 1987, 1988, and 1989, the first three years following the LBO. Revco used a fiscal year end of May 31, but, because the LBO was consummated on December 29, 1986, we adopted the convention of using the calendar year as the fiscal year to coincide with the LBO date. Thus, each of the projected years contains 12 months of sales covering the calendar years 1987, 1988, and 1989. The structure of the financing makes a longer forecast period unnecessary, because the first three years following the buyout represent the maximum risk exposure for Revco.¹⁷

Cash-flow coverage ratio was calculated as *EBIT* (earnings before interest and taxes) plus proceeds from asset sales (*AS*) less capital expenditures on new stores (*CAPEX*) plus depreciation (*DEPR*),¹⁸ divided by cash interest payments (*INT*) plus principal payments (*PRIN*) plus cash dividends (*DIV*), i.e.,

$$CF\ Coverage = \frac{(EBIT + AS - CAPEX + DEPR)}{(INT + PRIN + DIV)} \quad (1)$$

The ratios were modeled in a Lotus 1-2-3 spreadsheet and simulated with 200 iterations using "@RISK" simulation software.

For the most part, Revco's financial obligations (*INT*, *PRIN*, and *DIV*) were known at the time of the buyout and were, therefore, entered in the model as fixed numbers. Exhibit 3 summarizes Revco's cash payment obligations for the simulation period, 1987-1989. Interest on fixed-coupon debt, principal, and preferred dividend payments was determined according to the schedules reported in Securities and Exchange Commission (SEC) filings [1], [20]. Only cash payments were included in the simulation; no consideration was given to noncash obligations such as payment-in-kind (PIK) preferred stocks. Of the three preferred issues used in the buyout, two, the 15.25% cumula-

¹⁷Although not reported here, we also calculated an "EBIT Coverage" for each of the three years. *EBIT* coverage was calculated as earnings before interest and taxes divided by projected cash interest and principal payments on long-term debt and cash dividends on convertible preferred stock. These ratios are not reported in the interest of saving space and because, as an accounting-based number, *EBIT* coverage is not a true economic predictor of survival, our primary summary statistic. The results are available upon request.

¹⁸Depreciation is computed according to the net effect of the new stores opened (*CAPEX*) less the existing stores sold (*AS*).

Exhibit 3. Revco's Financial Obligations for 1987-1989 (in Thousands)

	1987	1988	1989
Principal payments	\$132,500	\$152,500	\$ 70,000
Fixed interest payments	112,802	112,802	112,802
Floating interest payments	42,088	29,831	15,725
Preferred dividends	<u>10,200</u>	<u>10,200</u>	<u>10,200</u>
Total cash obligation	\$297,590	\$305,336	\$208,727

Sources: [1], [20].

tive exchangeable and the 17.62% cumulative junior preferred, were PIKs. The 12.0% cumulative convertible preferred stock with a face value of \$85 million is responsible for the \$10.2 million of preferred dividends reported in Exhibit 3.¹⁹

Reported separately in Exhibit 3 are fixed- and floating-rate interest payments. Of the \$1,331 million of debt used in the LBO, \$455 million had a floating interest rate, and the remaining \$876 million had fixed rates. The fixed-rate debt obligations had an average interest rate of 12.9% with no principal payments due during the study period. The term loan was structured in such a way that Revco could choose interest payments as either 1.75% over the prime rate or 2.75% over LIBOR (London Interbank Offer Rate). The floating interest payments reported in Exhibit 3 assume that the prime-rate option is chosen and that prime remains at the December 1986 rate (7.50%) for the entire three years. The only payments of principal during the study period are for the term loan, as specified by its amortization schedule. Thus, the floating interest payments decline over time as the term loan is retired, whereas the fixed interest payment remains constant at \$112 million. To simulate the floating-rate interest payments, we modeled all the prime rate (*PRIME*) as a normal distribution with mean equal to the December 1986 rate of 7.50%

¹⁹In the course of our research, we uncovered several discrepancies between our estimates of Revco's financial obligations and those reported in the examiner's scenario analyses. In particular, the examiner assumed a faster pay down of debt, lower interest payments, and higher preferred dividend payments. The examiner's report does not provide sufficient detail for us to ascertain the basis of his assumptions in this regard, but our estimates are primarily from the merger prospectus filed December 18, 1986, just 11 days prior to the consummation of the buyout.

and a standard deviation of 3.60%, as estimated from historical data.

EBIT, *AS*, and *DEPR* remain as the stochastic variables needed to compute the coverage ratios. To calculate *EBIT*, we multiplied sales by an *EBIT* margin defined as

$$MARGIN = \frac{EBIT}{SALES} \quad (2)$$

MARGIN was modeled as normal with mean and variance estimated from historical performance data for Revco and other comparable companies.

The sale of existing stores and other assets (*AS*) was modeled as the appraisal figure given in the prospectus (\$230 million). Consistent with the prospectus, we assumed that the company could realize 100% of the divestiture proceeds during the first two years of the LBO. *AS* for 1987 was assumed to be uniformly distributed over 25 to 75%; i.e., the model assumed that Revco could sell with equal probability anywhere from \$57.5 million to \$172.5 million of the \$230 million of assets in the first year. For 1988, the second year after the buyout, *AS* equals the \$230 million less the realization of 1987 asset sales. Because of holding the total asset sales constant at \$230 million, the only uncertainty introduced into the model is the timing of the asset sales.

We modeled *AS* as described for several reasons. Unlike most other variables in the analysis, no historical data exist to guide us in the modeling of *AS*. The lack of data makes our modeling choices for *AS* somewhat arbitrary and, hence, easy prey to criticism. Faced with such a challenge, we chose to model *AS* in a way that the model would be biased in favor of finding a high survival probability. The first step in this direction was to assume, as Revco did at the time, that Salomon Brothers would be able to sell the assets within the first two years following the LBO. In our view, this assumption represents a best-case scenario for Revco.

The second step was to recognize that allowing the total amount of asset sales to vary around \$230 million would, in fact, act to reduce Revco's computed probability of survival. As was true for most LBOs, the Revco financial structure contained a covenant in the term loan that required any excess proceeds of the divestiture to be used as prepayments²⁰ of the loan. Thus, if Revco should happen to be lucky enough to realize more than the \$230 million for the assets at the end of the second year, the extra cash

could not be used to service the third year's cash flow obligations. Rather, the money would have to be used as a prepayment of the term loan, which would only slightly reduce the interest payments in the third year. On the other hand, if Revco should realize a shortfall in the sale of the assets, the reduced inflow would significantly reduce the firm's ability to service its obligations in the first and/or second years. The overall effect of allowing the \$230 million figure to vary is that the downside fluctuations hurt the survival of the LBO more than the upside fluctuations help it. Thus, our assumptions about *AS* are conservative and bias the model toward the conclusion that the LBO would succeed. Moreover, the examiner's report reveals [24, p. 151] that Revco's actual sales were approximately 14% under expectations, making our assumptions (*ex post*) somewhat optimistic.²¹

An offset to *AS* is *CAPEX*, the outlay required for starting new stores each year. To model this variable, we assumed new stores would open at a rate of 100 per year, consistent with the goals stated in the prospectus. We assumed that \$100,000 per store would cover the investment in fixtures, systems, and other assets unrelated to inventory and that, consistent with Revco's past practice, new store buildings and land would be leased.²² As new stores are added and existing stores sold in the model, total revenue is adjusted according to the assumed sales-per-year figure. Consistent with historical performance, new and mature stores' annual sales for 1987 were assumed to be \$945,000 and \$1,015,000, respectively. These sales figures are increased each year by a growth rate (*GROWTH*), assumed to be inflation, which was modeled as a normal distribution with a mean of 5.0% and standard deviation of 3.90% as measured from a time series of historical inflation rates. Depreciation expense (*DEPR*) was approximated as \$33.7 million for 1987 and was scaled according to the percentage net change of (*AS - CAPEX*).²³

²¹In view of the enormous debt tax shields anticipated by the company, we assume that a tax rate of 0% would apply to any gains on asset sales.

²²Based on an estimate by Ty Eggemeyer, a consultant and retailing executive.

²³The depreciation/amortization estimate equals that reported by Revco for 1986. A critical element in our analysis is the use of the historical average for earnings before interest and taxes (*EBIT*). The buyout resulted in a substantial increase in depreciation and amortization expenses as a result of purchase accounting and premiums paid over fair value. We used the old depreciation number to avoid invalidating the use of the historical *EBIT* average. Because the coverage ratios are computed on a pre-tax basis and *EBIT* is not reduced to reflect the added depreciation expense, only the old depreciation and amortization expense is relevant.

²⁰Customarily, debt prepayments are applied to the last scheduled amortization, thus practically preventing Revco from using surplus cash flow in 1987 from prepaying 1988 amortizations.

Exhibit 4. Parameter-Estimation Results for *MARGIN*, *GROWTH*, and *PRIME*

Variable	Historical Mean/Standard Deviation (%)	Kolmogorov- Smirnov Z-Score	Two-Tailed Probability	Simulation Mean/Standard Deviation (%)	Data
<i>MARGIN</i>	6.60/1.32	0.882	0.42	6.60/1.32	CPI: 1974-1986 [9]
<i>GROWTH</i>	7.00/3.90	0.593	0.87	5.00/3.90	EBIT: 1974-1986 Revco and Industry, COMPUSTAT files
<i>PRIME</i>	11.00/3.60	0.560	0.91	7.50/3.60	Prime rate: 1974-1986 [8]

B. Parameters of the Distributions

The parameters of *MARGIN* were estimated using historical *EBIT* data for Revco and a six-firm peer group from the drugstore retailing industry. Complete *EBIT* data were available for the sample of drugstore firms for the period 1974-1986. To maintain consistency in the estimation process, we used the same estimation period to estimate the means and variances of *GROWTH* and *PRIME*.

Exhibit 4 summarizes the results of our estimation procedure for the parameters of *MARGIN*, *GROWTH*, and *PRIME*. The sample distribution of each variable was tested against the null hypothesis of being normal using the Kolmogorov-Smirnov (KS) goodness-of-fit test. None of the KS tests produced Z-scores significantly different from zero at conventional probability levels. The KS test results suggest that our assumptions of normality are reasonable. The results do not tell us, however, whether the historical *MARGIN* mean of 6.60% is a reasonable estimate of Revco's future performance at the time of the buyout in 1986. In truth, the final choice of a mean is a subjective process that can always be debated. As a beginning point, however, we review the estimates made by the major players in the deal.

The examiner's report reveals strongly contrasting views among insiders and outsiders about Revco's future performance. Salomon and Revco advocated operating assumptions that others deemed aggressive in light of the performance of comparable companies and of Revco's own operating history. The examiner noted that the lowest sales growth rate contemplated by Salomon was 8%, while the lowest *EBIT* margin used was 6.5% [24, p. 34]. The agent bank in the buyout, Wells Fargo, ran a worst-case scenario [24, p. 42] assuming 8% sales growth (5% growth of new stores plus 3% inflation), whereas the investor group provided its banks with forecasts assuming 12% total sales growth. Goldman Sachs, the advisor to Revco's outside directors, determined that a 12% growth-rate as-

sumption was "too aggressive" (a more reasonable assumption was 8%) and that the assumption of a 7.7% gross margin was "a bit aggressive" [24, pp. 52, 53]. Ironically, Goldman ultimately opined that the investor group's projections were "realistically attainable" [24, p. 54].

Part of Revco's sales growth rate depended on the rate at which it planned to open new stores. The company's plan to open 100 new stores per year for the first five years was intended to discourage new entry by competitors into Revco's market areas [20, p. 11]. The wisdom of the aggressive expansion strategy is questionable, however, in light of the resulting drag on operating performance. The examiner noted that 70% of Revco's stores that were open less than one year lost money; the figure dropped to 48% for stores opened between one and two years [24, p. 42].

Our base-case assumptions for the Monte Carlo simulations are compared with the assumptions used by Revco and Salomon Brothers in Exhibit 5. The numbers differ in a couple of critical areas. In particular, our *EBIT* margin of 6.60% is much more conservative than Salomon's 8.0%. Exhibit 6 displays the time series of *EBIT* margin (*MARGIN*) for Revco and the six-firm peer group.²⁴ The exhibit shows that Revco's average margin for the period was 28% higher than the peer group (6.60% versus 5.15%), but Revco's performance in 1985 and 1986 (margins of 3.50 and 4.84%) was clearly below the long-run average. Revco's peak performance occurred in 1984 when *MARGIN* reached 8.14%, the only year in which *EBIT* reached the 8.0% level assumed by Salomon Brothers.

These numbers reveal that a 6.60% mean implies a 40% improvement over Revco's performance for the most recent two years (averaged *MARGIN* of 4.17%) and that Salomon's 8.0% *MARGIN* represents a 92% increase over

²⁴The peer group consisted of Jack Eckerd Corp., Fays Inc., Genovese Drug Stores, Perry Drug Stores, Rite Aid Corp., and Walgreen Company. Sales and *EBIT* data were collected from COMPUSTAT tapes.

Exhibit 5. Monte Carlo Versus Revco/Salomon Valuation Assumptions

	Monte Carlo Base-Case Assumptions	Revco/Salomon Assumptions*
<i>MARGIN</i> , mature stores	6.60%	8.0%
Standard deviation	1.32%	NA
<i>MARGIN</i> , new stores	6.60%	NA
Standard deviation	1.32%	NA
Corporate sales growth	NA	12%
Growth rate of sales per store	5.00%	NA
Standard deviation of store Sales growth rate	3.90%	NA
Number of new stores opened per year (<i>CAPEX</i>)	100	100
Floating interest rate		
Prime + 1.75%	9.25%	10.25%
Standard deviation of prime	3.60%	NA

*Source: Zaretsky [24].

the 1984-1985 average *MARGIN*. These increases in efficiency are much larger than those reported by Kaplan [13] and Muscarella and Vetsuypens [17], who found that margins increase by a total of approximately 19% over the three years following a buyout.²⁵ All things considered, we judge a 40% improvement in efficiency, as represented by the 6.60% margin, to be a generous expectation in the case of Revco's management.²⁶

For the standard deviation of *MARGIN*, we used 1.32%, the historical standard deviation of Revco's *MARGIN* for the 13-year time series. The average variance for the six peer companies over the same 13 years equated to a 1.25% standard deviation. Thus, while Revco's mean *MARGIN* was higher than the peer group, its standard deviation of *MARGIN* was approximately the same, which supports our choice of Revco's historical volatility for the base case.

²⁵Kaplan's [13] sample is of management buyouts during 1980-1986. Muscarella and Vetsuypens [17] studied reverse LBOs that occurred through July 1987. In a more recent paper, Kaplan [14] reports that, during the period 1980-1986, the highest realized increase in efficiency for MBOs occurred in 1985, when operating margins grew by 14.3% in the first year following the buyout.

²⁶We were able to obtain a sample of reverse LBOs from an investment banking firm that wished to remain anonymous. The sample included 12 retailing firms that went public during 1985-1986. The average operating margin for the sample was 6.40%, very close to our 6.60% figure.

For sales growth, we assumed sales per store would grow at an inflation rate of 5% and that new stores would be opened at the rate of 100 per year, less any stores sold. The combination of the 5% inflation growth plus the net growth of new stores is equivalent to an annual corporate sales growth rate of about 9% over the three years, noticeably smaller than Salomon's assumption of 12% growth. Our growth figure appears justifiable, because store growth is modeled as projected by the company, and our perusal of Revco's sales growth revealed no evidence that sales per store should grow faster than inflation in the late 1980s.

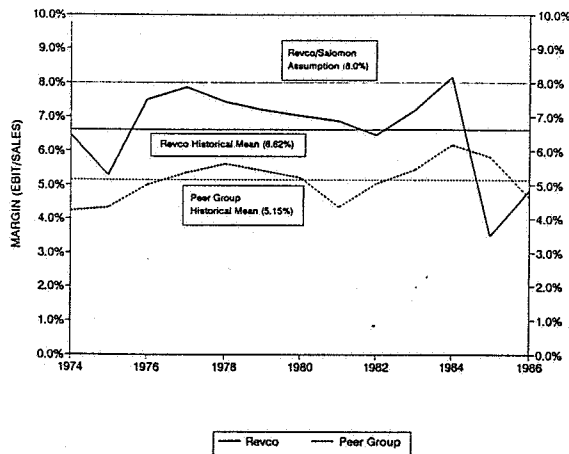
Inflation was modeled as a normal distribution with mean 5.0% and standard deviation of 3.90%. Given the low interest rates at the time (Treasury bills had consistently averaged under 6% since June 1986), an expectation of 5% inflation seems generous. Although our overall growth assumption is more conservative than Salomon's, the relevant issue is the influence of the assumption on the results, which our sensitivity analysis revealed to be negligible.

The prime rate was modeled to capture the effect of the floating-interest provision of the term loan. Prime was 7.50% in December 1986, implying a term-loan rate at the time of 9.25%, prime plus 175 basis points. Revco was allowed to reset the interest rate as often as monthly or as infrequently as semiannually. For convenience, and to maintain consistency with the annual data used to estimate the parameters, we assumed the prime rate to be normally distributed and reset at the beginning of each year. As reported in Exhibit 4, the standard deviation of the prime rate had been 3.60% for the period 1974-1986. Thus, *PRIME* was modeled as normal with mean equal to 7.50% and standard deviation of 3.60%.²⁷

No model can be an exact representation of reality. Regarding this model, we offer a couple of caveats. First, our simulation analysis ignores the effect of taxes, capital improvements to the mature stores, accounts receivable and inventory growth, and interest on seasonal debt. The inclusion of any of these factors, however, would have served only to depress the cash flow coverage ratios and decrease the estimated probability of survival relative to the nominal performance as reported here. Second, our base model assumes no covariance between growth and margins, and it assumes that each year is an independent draw, i.e., there is no serial covariance in *MARGIN*, *GROWTH*, or *PRIME* from year to year. Although not reported here, we found no qualitative difference in our

²⁷We disallowed negative interest rates by restricting the minimum prime rate to 2.0%.

Exhibit 6. EBIT Margin for Revco and Industry Peer Group



results when we assumed each variable to be a random-walk process with the previous year's outcome being the mean of the current year's distribution. A potentially more important serial covariance problem, however, is that induced by the action of management. For example, if cash flows in 1987 were running behind schedule, management could push to accelerate the asset divestitures to offset the expected shortfall. To the extent that management responds in this manner, the probability of survival as computed by our model has been biased downward. Thus, we have biased the survival probability upward with our calculation of cash flow and downward with the assumption of independence of cash flows. Although the net effect of these two biases is not apparent, the covariance bias can be neutralized fairly easily.

Rather than attempt the unwieldy task of modeling all the possible interactive effects, we computed a second probability of survival that allows for *complete* interaction between the cash flows occurring during the first three years. The "three-year" probability was computed by assuming that the sum of the cash flows for 1987-1989 would be available to service the sum of the financial obligations for the period. In other words, a bad draw in one year would not necessarily lead to ruin if the other two draws were large enough to make up the deficit. This is equivalent to assuming that management can carry forward any excess

cash flows as well as *borrow* costlessly from *future* excess cash flows. Hence, whereas the net bias of the independent survival probabilities is not apparent, the three-year probability is obviously biased upward and represents an upper bound on Revco's probability of survival.

IV. Results

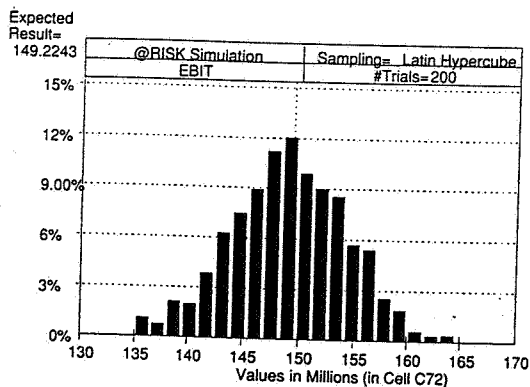
To illustrate the inputs and outputs of the model, Exhibit 7 presents a series of histograms of variable distributions as modeled for 1987, the first year following the LBO. The histogram in Panel A is a depiction of the *EBIT* distribution, which is a product of *MARGIN* and total revenue. Total revenue equals the number of mature stores times sales per mature store plus the number of new stores times the new-store sales rate. The vertical dashed line represents the mean, which is reported at the top of the y-axis as \$149.2 million. The histogram's bell shape reflects the dominating influence of modeling *MARGIN* as a normal distribution. Panel B contains the asset sales (*AS*) distribution for 1987. The approximately equal bars reflect the assumption that *AS* is uniformly distributed over the interval [\$57.5, \$172.5] million with a mean of \$115 million. *EBIT* plus net depreciation and *AS* equals "cash flow available," which is depicted in Panel C. Cash flow available is the numerator of Equation (1); i.e., the cash available for new-store investments and servicing financial obligations. Because Revco's total financial servicing obligation for 1987 was \$297.6 million (see Exhibit 3) and the mean cash flow available is \$288.7 million, the implied average CF coverage ratio for 1987 is 0.97, exactly equal to that reported in Exhibit 8 for the 1987 base case.

Exhibit 9 displays the CF coverage ratio distributions for 1987, 1988, and 1989. For these base-case scenarios, the mean coverage ratios are 0.97 in 1987, 0.98 in 1988, and 0.96 in 1989. The mass of the distribution to the right of 1.0 represents the probability of surviving a given year. Thus, the cumulative probability of survival is computed as the product of each of the three annual probabilities of realizing a ratio greater than 1.0. For the base case, the three annual probabilities of survival are 0.43, 0.45, and 0.27, and the cumulative probability of survival is 0.052 (0.43*0.45*0.27).

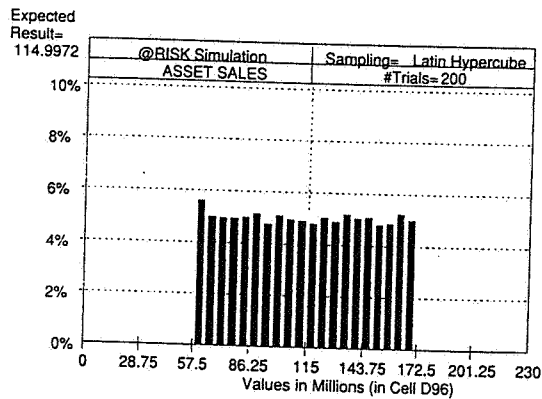
Exhibit 10 is the distribution of the three-year cash-flow-coverage ratio — i.e., the probability that the sum of the cash flows for 1987-1989 is sufficient to cover the sum of the obligations for the period. This ratio assumes that past and future cash flows are available to service the financial obligations for any year. Thus, the ratio represents a best-case measure of the model's estimate of Revco's ability to pay. The area to the right of 1.0 is the

Exhibit 7. *EBIT, AS, and Cash Flow Available: Histograms for 1987*

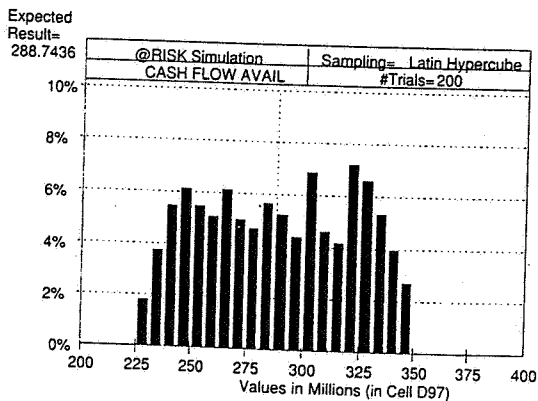
Panel A. *EBIT Histogram*



Panel B. *Asset Sales (AS) Histogram*



Panel C. *Cash Flow Available Histogram*



probability of survival. Because the ratio has a mean less than 1.0 (0.97) and the variance of the distribution is small, the probability of survival is approximately 30%, much larger than the product of the three independent-year probabilities computed using the Exhibit 5 distributions equal to 5.2%.

To test the robustness of the model to our assumptions, we performed two comparisons. First, we conducted a sensitivity analysis on the means of the stochastic variables.²⁸ As revealed in Exhibit 10, the coverage ratios for Revco are consistently less than 1.0, and the probability of successful coverage remains low regardless of variations in assumptions for *MARGIN*, *GROWTH*, and *STORES* (the number of new-store openings per year). Increasing the expected *EBIT* margin to Salomon's assumption of 8.0% results in a probability of survival of 48%, the highest cumulative probability produced in the sensitivity analysis.

The three-year ratio probabilities in Exhibit 8 are consistently higher than the cumulative independent probabilities for the three years. For example, the base-case probability is 30% for the three-year ratio compared to only 5% assuming independent cash flows. The reader should keep in mind that the three-year ratio is a strong upwardly biased measure of survival and that the base-case probability of 30% is, in itself, a very low survival probability. The three-year probability rises to 94% if Salomon's *MARGIN* of 8.0% is used, but for every other scenario reported in Exhibit 8, the three-year probability is 40% or less. Interestingly, when *MARGIN* is assumed to equal Revco's average performance for 1984-1985 of 4.17%, the probability of survival is virtually zero under either probability measure. Thus, with the exception of assuming *MARGIN* to equal 8.0%, the model yields consistently low survival probabilities for Revco.

As a second check of the model's robustness, we applied the simulation to the Jack Eckerd Corporation, one of Revco's competitors in discount-drugstore retailing and itself the subject of a leveraged buyout in 1986.²⁹ As with Revco, we used historical performance data as the basis for *EBIT* projections and SEC filings [7] for financial

²⁸In the interest of conserving space, we have not reported the results of our sensitivity analysis on the standard deviations of the distributions. None of the standard deviations had a qualitative impact on the probabilities. Because the floating-rate interest payments were such a small part of the total financial obligations, we also chose not to include *PRIME* in the sensitivity analysis.

²⁹The buyout was by Eckerd management and an investor group led by Merrill Lynch Capital Partners, Inc., which paid \$1.2 billion in cash or \$33 per share. Shareholders approved the LBO on April 30, 1986.

Exhibit 8. Monte Carlo Simulation Results

	Independent Annual Cash Flow Coverage Ratios				Three-Year Cash Flow Coverage Ratio	
	1987	1988	1989	Probability of Survival	1987-1989	Probability of Survival
Base case	0.97	0.98	0.96	0.05	0.97	0.30
Sensitivity Analysis of Means (μ):*						
<i>MARGIN</i> : Base-case $\mu = 6.6\%$						
Revco's 1984-85 performance: $\mu = 4.17\%$	0.79	0.79	0.65	0.00	0.83	0.00
Salomon's assumption: $\mu = 8.0\%$	1.08	1.09	1.14	0.48	1.10	0.94
<i>GROWTH</i> : Base-case $\mu = 5.0\%$						
1.0% under base case: $\mu = 4.0\%$	0.97	0.98	0.94	0.02	0.96	0.20
1.0% over base case: $\mu = 6.0\%$	0.98	0.99	0.98	0.06	0.98	0.40
<i>STORES</i> : Base-case $\mu = 100/\text{year}$						
50 under base case: $\mu = 50/\text{year}$	0.97	0.97	0.92	0.02	0.96	0.23
50 over base case: $\mu = 150/\text{year}$	0.97	1.00	1.00	0.10	0.99	0.40

*Variable definitions are:
MARGIN = *EBIT*/Sales.
GROWTH = Growth rate of same store sales.
STORES = New stores opened per year.

obligation projections. Over the period 1974-1986, Eckerd's *MARGIN* averaged 8.11% with a standard deviation of 1.42% compared to Revco's 6.60% and 1.32%. A more important difference from Revco, however, was that Eckerd's interest and principal payment schedules were substantially deferred. The simulations for Eckerd produced coverage ratios of 1.30, 1.35, and 1.40 for the first three years following the buyout. These individual probabilities imply a cumulative probability of survival of 95% and a three-year probability of 95% also.³⁰

V. Conclusions and Implications

The analysis in this study suggests that Revco had a probability of between 5 and 30% of successfully servicing its financial obligations in the first three years after going

private. These survival possibilities are so low as to suggest that Revco was undercapitalized in the sense that the new debt obligations exceeded its expected cash flow and hence, the buyout was doomed to fail from the start. It is only when Revco's earning power is assumed at almost double that of its recent past that the survival probability (assuming independence of cash flows) approaches 50%. The survival probabilities are relatively insensitive to assumptions concerning asset sales and growth of sales suggesting that it was the leveraged buyout and the restructuring strategy rather than flawed execution of the strategy by management that drove Revco down. Ironically, the strategy of the newly private Revco was to focus on asset sales and growth, and only secondarily to focus on profitability. The deteriorating environment for retailers in late 1987 and 1988 could be chalked up as bad luck, but we believe the hallmark of a good strategy is the ability to withstand unforeseen adversities. We leave it for others to speculate as to why the deal was consummated.

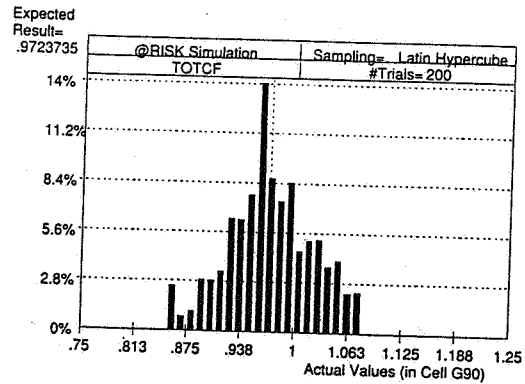
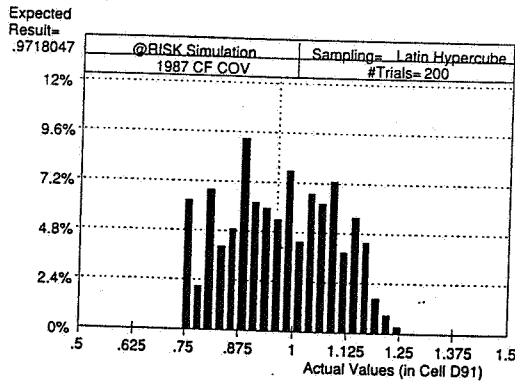
A simulation-based research methodology, such as that used here, has its weaknesses. Our strategy has been to address the weaknesses by stating them plainly and then to construct the model so that it is biased in favor of

³⁰The *GROWTH* distribution is identical to that used for Revco. The interest rate on Eckerd's revolving credit loan of \$690 million equalled either the prime rate plus 125 basis points or LIBOR plus 250 basis points. Prime at the time of the Eckerd LBO (April 1986) was about 9.0%. Thus, we assumed a base rate of 9.0% for Eckerd as opposed to the rate of 7.5% used for Revco. Detailed results of the Eckerd simulation are available upon request.

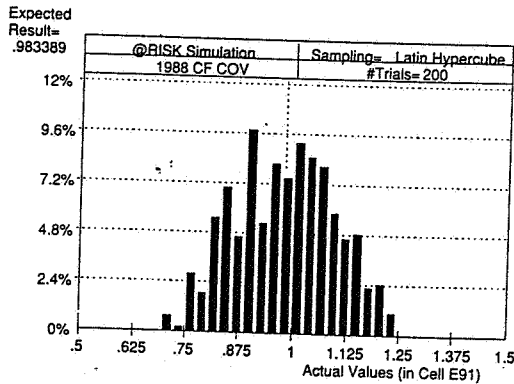
Exhibit 9. Cash Flow Coverage Ratio: Histograms for 1987, 1988 and 1989

Exhibit 10. Interactive Cash Flow Coverage Ratio: Histogram for 1987-1989

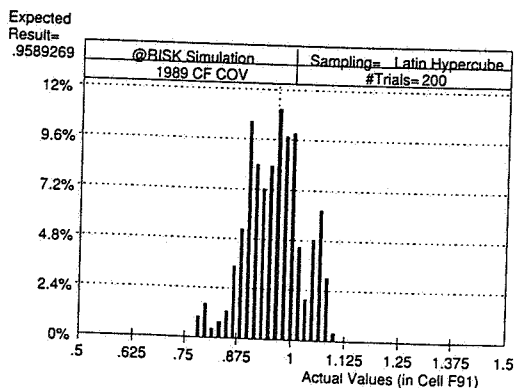
Panel A. 1987



Panel B. 1988



Panel C. 1989



survival. The base-case assumptions were reasonable in that they were consistent with information a financial analyst would have had in December 1986, when Revco went private. Other assumptions for which there was no strong base of public information or historical experience (e.g., tax exposure, asset sales, working capital requirements) were tilted in Revco's favor. Despite the model being biased in favor of survival, however, we consistently found low survival probabilities and conclude that they arise because of Revco's onerous payment schedule and anemic earning power rather than as an artifact of our methodology. Our sensitivity analysis revealed that even granting the optimistic assumptions used by Revco's financial advisers and bankers produces survival probabilities of less than 50%. Indeed, no set of forecast assumptions surveyed in the bankruptcy examiner's report gave high probabilities of survival. In addition, testing our methodology on another drug retailer taken private at about the same time, Jack Eckerd Corporation, produced high probabilities of survival. In other words, our *ex ante* approach produced results that are consistent to date with the fates of Revco and Eckerd. Thus, we conclude that the model discriminates reasonably well and is not prone to predict disaster for every LBO.

The primary implication of this study for research on LBOs is that terms of financing matter and warrant scholarly attention. Finance researchers have to date given more

attention to the operating aspects in LBOs than to the terms of financing. By "terms of financing," we mean the detailed financial design of the buyout, including the time series of debt service obligations and the underlying terms of the different layers of capital. There is virtually no scholarly work in print on the rich variation in financial design from one buyout to the next. Why, for instance, were the time series of debt service obligations so different for Revco and Jack Eckerd which are fairly similar companies?

The primary implication of this study for jurists, legislators, and practitioners in finance is that "capital adequacy" has less to do with the amount and mix of types of capital, and more to do with the firm's expected cash flow and the time profile of debt service obligations. This is consistent with Donaldson's [6, p. 150] conclusion that,

... widely used rules of thumb which evaluate debt capacity in terms of some percentage of balance sheet values or in terms of income statement ratios can be seriously misleading and even dangerous to corporate solvency... debt policy in general and debt capacity in particular cannot be prescribed for the individual company by outsiders or by generalized standards; rather they can and should be determined by management in terms of individual corporate circumstances and objectives and on the basis of the observed behavior of patterns of cash flows.

The public policy debates over leveraged buyouts have been sprinkled with references to the high debt-equity ratios typical of these deals; but such statistics are weak indicators of risk. An economic test of buyout risk or fraudulent conveyance should look to the probability of survival, though we admit that a precise measurement of this probability is difficult. Moreover, there are no standards by which an objective observer can parse out expected survivors from expected mortalities. In cases of very low probability of survival like Revco, however, the test of capital adequacy is intuitively easy: only upon extremely optimistic expectations could one have predicted that Revco's financial obligations would be manageable.

In sum, the provocative findings of this study invite more scholarly and applied research on the capitalization of firms. Based on our experience in conducting this study, we conclude that the richest insights in this area are bound to come from the analysis of individual cases or small samples of firms.

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