

Plant Closings for Financially Weak and Financially Strong Firms

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Abstract

Permanent plant closing announcements provide information not only about the value of the closed plant, but also about the entire firm's financial condition. A permanent plant closing indicates the expiration of operating options attached to the plant as well as the out-of-the-money expiration of the option to sell the assets to other potential users. Unless investors already know the true value of the plant, the resulting downward revision in cash flows causes a negative stock price reaction at the closing announcement. This study shows that the stock price reaction is particularly negative for firms already in a weak financial condition and for plants that comprise a larger proportion of the firm's operations.

Introduction

This research examines valuation effects of plant closing announcements from the standpoint of the financial health of firms making such announcements. This examination is premised on the consideration that a plant is not an isolated profit center, but an integral component of the firm's total operations. Therefore, a closing announcement may convey negative information not merely about the particular plant being closed, but also about the firm making that announcement. The negative information generated by a plant closing announcement presumably is greater for firms that cannot afford more bad news, i.e., firms that are already in unfavorable financial condition.

Eddy and Siefert (1986) have studied announcement effects of one type of bad news for firms in unfavorable financial condition. They find a severe negative market reaction to announcements of dividend cuts and omissions for financially weak firms. These announcements made by financially weak firms

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present strong signals of changing firm prospects. Hence, stock prices decline accordingly.

This research examines the announcement effect of a different type of bad news: plant closings. It examines the broader information implications of a plant closing by considering simultaneously the announcement of decline in abandonment value of the specific plant being closed and the financial health of the firm making the announcement. Using the firm's bond rating as a proxy for financial health, this research proposes that market reaction to a plant closing announcement by a financially weak firm is more severe than that for a firm that is financially sound. For a financially weak firm, as in other cases of voluntary disclosure of bad news, a plant closing announcement may be only the tip of an iceberg of other problems for the entire firm.

This study shows that the market reaction to a plant closing announcement is significantly negative for firms with lower (BAA and below) bond ratings. Announcements by firms with higher (A and higher) bond ratings are met by an insignificant positive market reaction. The significant negative reaction remains after controlling for the size of the plant relative to the size of the firm.

The Information Content of Plant Closing Announcements

A Hypothesis for a Negative Reaction

The decision to undertake a project gives the firm the option to abandon it when the discounted value of cash flows from operating the project is less than the expected cash benefits of abandoning it (Majd and Pindyck, 1987; Robichek and Van Horne, 1967; Dyl and Long, 1969; and Joy, 1976). Expected cash benefits on abandonment may be realized by selling an abandoned plant to a higher value user. In the case of a plant closing, however, there are no cash inflows from a sale because the plant is not sold, but idled. Abandonment benefits accrue only through loss avoidance by not operating the plant at a loss. Therefore, the option to sell the plant to a higher value user becomes deeply out-of-the-money and may expire worthless.

A plant closing also eliminates two options for the firm's other operations:

- Managerial flexibility, which enables management to make or revise future operating decisions; and
- The strategic option of interdependence of an operating plant with current and follow-up investments (Mason and Merton, 1985; Majd and Pindyck, 1987; and Trigeorgis and Mason, 1987).

These options remain alive for a plant in operation. A permanent plant closing causes these operating options to expire worthless and causes a downward revision of future cash flow and profitability for the firm.

Both the sell-off option becoming out-of-the money and the expiration of operating options attached to the plant cause a downward revision in investor expectations of cash flows for the firm, unless investors are already aware that these options are out-of-the money. If investors were previously aware of the true value of the plant and its associated operating and abandonment options and also had anticipated the closing, then the announcement contains no new information. Therefore, there would be no market reaction to the announcement under this scenario. If investors were previously aware of the plant's value but nevertheless anticipated that it would remain in operation to the detriment of the shareholders, then the closing announcement would be associated with expectations of increased future cash flows as future losses are avoided. Therefore, there could be a positive market reaction. Although not a common occurrence, Statman and Sepe (1989) provide some evidence of this latter scenario.

Previous evidence on the effects of downward revision of cash flows supports the hypothesis of a negative stock market reaction. McConnell and Muscarella (1985) find a negative stock market reaction to announcements of unanticipated project-specific capital budgeting decreases. Negative valuation effects, although small, also are found by Owers and Rogers (1986) who examine stock price reaction to announcements of abandonments. Strong and Meyer (1987) find a small negative market reaction to announcements of asset write-downs.

Blackwell, Marr, and Spivey (1990) find a negative stock price reaction to announcements of plant closings. They posit that the negative reaction is attributable to unprofitable operations of the closed plant and that the intensity of the reaction is related to the size of the closed plant. The larger the plant being closed, the greater should be the effect of the closing announcement on the firm's stock price.

This research focuses on the financial condition of the firm making the announcement and hypothesizes that the stock price reaction to the closing announcement will be more severely negative for firms that are in poor financial condition than for firms in better financial condition. This comparison must control for size of the closed plant.

The Role of Bond Ratings

Previous empirical research on the determinants of bond ratings (Pinches and Mingo, 1973) and on the keys used by agencies in the rating process (Ederington, 1985) indicates that cash flow is an important determinant of bond

ratings, along with leverage, liquidity, and issue size. A low bond rating is indicative of problems in funding projects from internally generated sources. It also signifies the firm's limited capacity to sell additional debt at low cost. Such funding difficulties can impair financing new projects. Therefore, a closed plant for a financially weak firm is not likely to be replaced by new productive capacity.

Statman and Sepe (1989) maintain that managers tend to delay project termination beyond the optimal time that minimizes the present value of cash flow losses. A plant closing may be delayed, but it cannot be avoided indefinitely, for delayed closing creates a cash drain for the firm not sustainable in the long term. Shareholders, recognizing the necessity to minimize cash drain, could interpret a closing announcement as another indication that the firm as a whole is experiencing cash flow problems. Given that a bond rating provides some evidence of the firm's ability to generate cash flows, a plant closing announcement by a firm with a low bond rating provides some indication for financial distress. While abandonment by sale may not always connote financial distress (Owers and Rogers, 1986), abandonment by closing is a much stronger indication for financial distress.

For a firm with lower rated bonds the possibility of severe cash flow problems is apparent. Shareholders cannot expect positive operating cash flows from the plant to be available to meet disbursements, nor can they expect a cash influx from the sale of the plant's assets. Consequently, the stock price reaction to plant closing announcements should be more negative for firms with lower rated bonds than for firms with higher rated bonds.

Data Sources

The sample of plant closing announcements was obtained by searching the *Wall Street Journal Index* for announcements of plant closings from 1980 through 1986, inclusive. This search identified 982 announcements.

The sample was subjected to the following criteria:

- The plant closing must have been permanent, with the site never reopened. Permanency of the closing was verified by absence of a reopening announcement in the *Wall Street Journal Index* for the period 1980-1986.
- The plant closing must have been unanticipated, with no prior published announcement of the possibility of a closing. The unanticipated nature was assured by the lack of information in the *Wall Street Journal* linking the performance of the firm with the potential for a plant closing.

- The firm announcing the plant closing must have had securities traded on either the NYSE or AMEX when the closing was announced.
- The plant closing must have been voluntary; i.e., it was not closed for safety, environmental, or regulatory-related reasons such as might occur for an electric utility plant. Nor could the plant closing have been motivated by political or social reasons such as might be the case for plant closings in South Africa.
- No announcement by the firm of any kind could be reported between five days prior and five days following the plant closing announcement. The *Wall Street Journal Index* was searched for any contaminating information effect, such as an earning or dividend announcement.

Application of these criteria reduced the sample of 982 announcements to 344. This number was reduced further to 282 announcements (made by 187 firms) because of lack of a CUSIP number, missing information during the estimation interval on the CRSP tapes, or missing CRSP data on the announcement date.

Information on the final sample of 282 closing announcements is presented in Table 1. Panel A of Table 1 contains the distribution of closings by year and Panel B provides summary statistics for firms closing plants and summary statistics for announcements of closings.

Bond rating information from *Moody's Manual* was obtained for each of the 187 firms in the sample. The bond rating was taken as of the date of the plant closing announcement.

Shareholder Wealth Effects from Plant Closing Announcements

Methodology

To study shareholder wealth effects associated with plant closing announcements, the event study methodology as described by Brown and Warner (1985) was applied. Separate event study analyses were performed based on differences in bond ratings and differences in relative plant size. Because the relative size of the plant is an important determinant of the market reaction (Blackwell, *et al.*, 1990), cross-sectional regressions designed to explain residual returns while controlling for differences in plant size also were estimated.

Prediction errors are calculated for each security i and day t according to:

$$(1) PE_{it} = R_{it} - (A_i + B_i R_{mt})$$

where:

R_{it} = Rate of return on security i for day t ; and

R_{mt} = Rate of return in the CRSP equally weighted index for the same day.

The coefficients of the market model, A_i and B_i , represent the intercept and slope of the market model. These coefficients are estimated with ordinary least squares over an estimation period that begins 200 days prior to the announcement and ends 60 days before the announcement.

Equation (1) is used to calculate the prediction error for each firm and each trading day within the event period, which extends from 60 days prior to the closing announcement until 60 trading days following the announcement. The average prediction error for the sample of n observations on each event day is calculated according to:

$$(2) APE_t = 1/n \sum PE_{it}$$

The test statistic z_t for the average prediction error is based on the standardized prediction error (SPE) calculated as:

$$(3) z_t = SPE_{it}/n^{0.5}$$

In addition to this parametric test, the announcement effect also is examined via two distribution free approaches: comparison of the number of negative prediction errors to the number of positive prediction errors, which is the basis of the sign test, and the test of significance for the Wilcoxon signed rank test (Conover, 1971).

Results for the Total Sample

Table 2 contains the results of the event study analysis for the entire sample. Panel A contains average prediction errors (APEs), the z -statistic, the cumulative prediction error, the percentage of APEs that are negative, and the significance level of the Wilcoxon signed rank test in the period from 20 days prior to the announcement to 20 days after the announcement. Panel B contains the same information for selected intervals around the announcement.

The largest and most statistically significant APE of -0.439 percent occurs on the announcement day of the plant closing with another negative, but not statistically significant, APE of -0.143 percent for the immediately preceding day. The two day APE is statistically significant at the .01 level, with a mean of -0.582 percent. The nonparametric Wilcoxon test also indicates a statistically

significant market reaction, with the significance level exceeding .01 on the announcement day. The day prior to the announcement the significance level is 0.056 according to this nonparametric test.

Cumulative prediction errors shown in Panel B indicate significant prediction errors for days -1 through 0 and days -2 through 0, but not for days immediately after the announcement, including days +1 through +10. Therefore, there appears to be a quick market adjustment to the information release with no evidence of a readjustment or of additional information effects immediately following the announcement.

The Size of the Plant Closing

Table 3 presents prediction errors according to the absolute size of the plant closing measured by the number of employees laid off and the relative size of the plant closing measured by the number of employees laid off as a percentage of the total employment in the firm. The absolute size measure indicates a larger impact of the announcement for small employee layoffs than for large employee layoffs. This result may stem from smaller plants being characteristic of small firms where the firm is not as well diversified across plants or products. The relative measure strongly supports this rationale, with large layoffs as a proportion of total employment showing large negative prediction errors that are significant at the .01 level. In contrast, announcements of plant closings with a small proportion of total employees laid off show a small positive, but not statistically significant, prediction error.

The Impact of Bond Rating Differences

Table 4 presents the market reaction to plant closing announcements partitioned according to bond ratings. Firms with lower rated bonds show a more negative reaction to plant closing announcements than do firms with higher rated bonds. The two day prediction error for firms with bonds of the highest rating (AAA) is 0.503 percent, while firms with the next highest bond ratings (AA and A) have a two day prediction error of 0.105 percent. Neither of these results is statistically significant.

Firms with lower bond ratings (BAA or lower) perform substantially worse, with a two day average prediction error that is negative and statistically significant at the .01 level. Firms whose bonds are not rated perform about the same as the entire sample.

The dramatic difference between firms with high rated bonds and firms with low rated bonds is consistent with the proposition that plant closings may signify deeper financial problems for firms that already show signs of financial

weakness. For firms with higher rated bonds, the possibility of severe cash flow problems is rather remote. For firms with lower rated bonds, the prospect of reduced cash flows and the loss of future options make this possibility even more alarming. Therefore, stock prices react more negatively to the bad news.

Cross-Sectional Analysis

In order to examine the relationship between the market reaction and bond ratings while controlling for the effect of relative plant size, the following regression model was estimated:

$$(4) \text{CSPE}_i = a_0 + b_1(\text{EMPL/TOTEMP}_i) + b_2(\text{BR}_i)$$

where:

- CSPE_i = Two day standardized cumulative prediction error;
 EMPL/TOTEMP_i = Measure of relative plant size; and
 BR_i = Dummy variable for bond rating.

In equation (4) the relative size of the closed plant is measured by the ratio of employment lost to the firm's total employees. The bond rating variable is a dummy with a value of 0 if the bond rating is A or higher and a value of 1 if the bond rating is Baa or below.

The estimation results of the regression model are presented in Table 5. The F-statistic reported in the table indicates that the regression model has statistically significant explanatory power at the 0.05 percent level. In addition, both coefficients of the variables considered have the correct sign. The bond rating coefficient is statistically significant at the 0.025 percent level, while the relative plant size effect does not appear as a significant independent variable.

Summary and Conclusions

Announcements of plant closings indicate that the sell-off option for the plant is out-of-the money and that the firm's operating options are also out-of-the money. A permanent closing indicates that these options have expired out-of-the-money. This information prompts a revaluation of the firm's entire cash flows. Although a negative market reaction is observed at the announcement of plant closings, the intensity of the reaction strongly depends on two factors:

- The relative size of the closing as measured by the proportion of employees laid off to total employment by the firm; and

- The firm's financial condition measured by its bond rating.

The empirical findings indicate that there is significant relationship between abnormal returns and bond ratings. The stock market reaction is strongly negative and statistically significant for firms with lower bond ratings, but not significant for firms with higher bond ratings. Such findings are indicative of the market's belief that deeper problems may have beset those firms in weak financial position that have announced plant closings.

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Table 1
Sample Characteristics

Panel A
Calendar Distribution of 282 Plant Closing Announcements
of NYSE and AMEX Firms

Year	Number of Plant Closing Announcements	Percentage of Total (%)
1980	50	17.7
1981	29	10.3
1982	46	16.3
1983	47	16.7
1984	46	16.3
1985	37	13.1
1986	27	9.6
Total	282	100.0

Panel B
Selected Summary Statistics for 282 Announcements and 187 Firms Announcing Plant Closings
for 1980-1986

Descriptive Measure	Number of Observations	Mean (Range)	Median	Standard Deviation
Firm Statistics				
Firm asset size (million \$)	134	5,625.51 (9,867-149,530.1)	1,375.42	1,543.9
Long-term debt/ market value of common stock	134	0.613 (0.0-0.928)	0.354	0.707
Number of plants closed per firm	187	1.425 (1-13)	1.0	1.117
Number of announcements of plant closings per firm	187	1.508 (1-8)	1.0	1.054
Announcement Statistics				
Employment lost per announcement of plant closing	282	547.3 (10-8500)	300	898.5
Number of plants closed per announcement	282	1.46 (1-9)	1.0	1.394

Table 2
Average and Cumulative Prediction Errors of 282 Plant Closings
1980-1986

Panel A
Average and Cumulative Prediction Errors for the Period (-20, +20)
Around the Event Day

Event Day	Average Prediction Error	z-Statistic	Cumulative Prediction Error	Percent Negative	Test p-value
-20	-0.071	-0.307	1.612	52.1	0.240
-10	-0.064	-0.435	1.493	53.9	0.099
-9	0.197	1.814	1.690	45.7	0.056
-8	-0.059	-0.991	1.631	55.0	0.122
-7	-0.135	-1.226	1.496	53.9	0.070
-6	0.165	1.266	1.662	48.9	0.434
-5	0.094	0.955	1.756	46.5	0.227
-4	0.192	1.903	1.947	47.2	0.069
-3	0.122	0.545	2.069	51.8	0.496
-2	-0.019	0.111	2.051	51.8	0.288
1	-0.143	-1.002	1.907	53.9	0.056
0	-0.439	-3.554*	1.468	51.4	0.068
1	0.133	1.792	1.601	48.9	0.360
2	0.135	1.522	1.737	50.9	0.428
3	0.110	1.307	1.847	44.7	0.132
4	0.111	0.336	1.958	49.6	0.440
5	-0.049	-0.891	1.909	52.8	0.201
6	0.371	2.554*	2.280	45.6	0.017
7	-0.041	-0.110	2.239	52.1	0.348
8	-0.238	-2.268**	2.001	56.2	0.042
9	-0.058	-0.476	1.943	53.0	0.080
10	-0.028	-0.364	1.914	54.1	0.305
20	0.168	1.139	2.442	51.4	0.423

Two Day [-1,0] Prediction error: -0.582%

z-value: (-3.222)*

Wilcoxon Test: 0.0006

Standard Deviation: 4.145

Largest positive prediction error for 2 days: 16.793%

Largest negative prediction error for 2 days:-31.249%

* Indicates the null hypothesis can be rejected at the 0.01 level of significance

** Indicates the null hypothesis can be rejected at the 0.05 level of significance

Panel B
Interval Analysis of Cumulative Prediction Errors

Interval	Prediction Error	Cumulative z-statistic	% Negative p-value	Wilcoxon Test
[-1, 0]	-0.582	-3.222*	51.1	0.062
[-1, 1]	-0.450	-1.596	51.1	0.101
[-2, 2]	-0.333	-0.507	54.3	0.106
[1,10]	0.446	1.076	47.9	0.151

* Indicates the null hypothesis rejected at the 0.01 level of significance

** Indicates the null hypothesis rejected at the 0.05 level of significance

Table 3
Two Day Prediction Errors at the Announcement of Plant Closings According to Size of Closed Plant

Subsample	Number of Announcements	APE (z-value)	% Negative (p-value)	t-test Differences
Absolute Plant Size				
Large Plants (more than 1000 layoffs)	38	-0.611 (-1.373)	55.6 (0.1603)	0.433
Small Plants (less than 200 layoffs)	64	-0.872 (-2.310)*	54.5 (0.058)	
Relative Plant Size				
Large Plants (layoffs/total firm employment > 20 per cent)	50	-1.720 (-4.345)*	67.1 (0.003)	3.261*
Small Plants (layoffs/total firm employment < 6 per cent)	35	0.136 (0.521)	42.9 (0.256)	

*Significant at the .01 level.

Table 4
Debt Ratings for a Sample of 187 NYSE and AMEX Firms
Announcing Plant Closings (1980-1986)
and Average Two Day Abnormal Return for Firms
Grouped by Rating of Outstanding Debt

Rating	Number of Firms (No. of Announcements)	Two Day Prediction Error (%) (z-value)	% Negative (p-value Sign Rank Test)
Firms rated AAA	9 (9)	0.503 (0.627)	34.0% (0.187)
Firms rated A and AA	64 (113)	0.105 (0.216)	51.5% (0.488)
Firms rated BAA or below	32 (48)	-2.421 (-4.643)*	68.2% (0.001)
Firms without rating	82 (112)	-0.697 (-2.174)**	54.3% (0.057)

* Indicates the null hypothesis can be rejected at the 0.01 level of significance

** Indicates the null hypothesis can be rejected at the 0.05 level of significance

Table 5
Estimated Coefficients and t-statistics
From Regressing Standardized Cumulative
Two Day Prediction Errors on Various Variables
for 282 Plant Closing Announcements
1980-1986

$$CSPE = a_0 + b_1(EMPL/TOTEMP) + b_2(BR)$$

a_0	b_1	b_2	n	R^2	F-Value (Prob>F)
1.223 (2.113)*	-0.011 (-1.482)	-1.120 (-2.459)*	123	0.068	0.0139

*Indicates the null hypothesis can be rejected at the 0.05 level of significance

