The Relationship Between Earnings Goals and Expenditures for Repairs and Maintenance

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Abstract

This study examines whether American industry adjusts the level of expenditures for repairs and maintenance to meet earnings goals. We examine changes in repairs and maintenance expenditures when earnings vary from expectations and find evidence of a direct relation between these variables. This finding raises concerns since deviation from consistent repairs and maintenance programs solely to meet earnings goals may have a detrimental effect on the competitiveness of U.S. firms.

Introduction

A disastrous flood in downtown Chicago on April 13, 1992 caused several hundreds of millions of dollars in damages to businesses and individuals. Mayor Richard M. Daley said the disaster could have been avoided had a \$10,000 repair been made.¹ Discussions following the flood raised concerns that the disaster may have been the result of budget cuts and could have been avoided with consistent repairs and maintenance.

In the private sector, there has also been considerable concern that when profit goals become difficult for management to achieve due to poor sales or rising expenses, managers may be motivated to find ways to minimize the impact on short-run earnings. Among other things, managers may elect to reduce discretionary operating expenditures such as product quality and promotion, customer relations, research and development, and routine repairs and maintenance. The immediate effect may be to improve the reported profitability of the firm at the expense or risk to the competitiveness and long-run viability of the firm.

Managers have some discretion in meeting earnings goals through operating decisions or accounting choices. The former affects decisions on the timing of discretionary cash flows while the latter involves selection of accounting methods or estimates. Prior studies have examined both types of management choices, including special write-offs

(Elliot and Shaw, 1989), research and development [(Perry and Grinaker, 1994); (Baber, Fairfield and Haggard, 1991)] and bad debt expense (McNichols and Wilson, 1988). However, the repairs and maintenance option has not been studied. This study examines the extent to which managers adjust expenditures for repairs and maintenance when faced with pressures to align reported earnings with earnings expectations. Using data for 196 U.S. firms during the period 1975-1990, our results indicate a positive linear relation between relative repairs and maintenance and earnings changes.

Research Design

The lack of research in the repairs and maintenance area can be explained, in part, by the difficulty in collecting repairs and maintenance data. Most specific income statement variables used in "earnings management" studies are available directly from the Compustat data base. Repairs and maintenance, however, is not available from this data set, and must be gathered manually from supplemental filings to the annual Form 10-K filed with the Securities and Exchange Commission.² This data set is, therefore, quite interesting since repairs and maintenance expenditures reflect discretionary decisions (at least in the short run) not easily observed and analyzed by users of financial information published in annual reports.

Sample

Our sample is based on 250 firms chosen at random from companies listed on the Compustat data base. The firms had to satisfy the following criteria in order to remain in the sample: (1) Gross Plant, Property and Equipment in excess of 30% of Total Assets; (2) Depreciation and Amortization expense in excess of 3% of Sales; (3) Historical data available on the 1990 Compustat data base for years 1974-1990. The first two criteria ensure that repairs and maintenance is a significant operating decision for the sample firms. The third criterion establishes the availability of necessary financial data. Repairs and Maintenance expense was then collected from Schedule X, Supplemental Income Statement Information, Form 10-K. The final sample of 196 firms and 2,505 pooled firm-year observations meet the above criteria and have repairs and maintenance data available from the Supplemental 10-K filings. Our study encompasses the 1975-1990 period. Data from 1974 were necessary to calculate yearly changes in the first year of our study. Descriptive statistics on net income, repairs and maintenance, sales, and cash flows for our sample are provided in Table 1. Mean repairs and maintenance are almost four percent of mean sales and the ratio of mean repairs and maintenance to mean net income is approximately 75 percent.

Expectation Models

The primary hypothesis of this study is that when earnings are expected to fall below targets, management will defer repair and maintenance expenditures. In addition, we test whether these deferrals are made up when

earnings are expected to be greater than the goal. In order to test these hypotheses, it is necessary to model both expected repairs and maintenance expense and expected earnings.

Model: Relative Repairs and Maintenance (RRM)

Since expected repairs and maintenance expense is unobservable, we use the prior year's repairs and maintenance to approximate the current year's expectation.³ Relative repairs and maintenance expense (RRM) is defined as

$$RRM = (R\&M_{i,t}/R\&M_{i,t-1})$$

where RRM is the ratio of the current year's repairs and maintenance expense to the prior year's repair and maintenance expense. R&M is repairs and maintenance expense scaled by gross plant, property, and equipment to control for firm size and (to a lesser extent) for inflation. Model: Unexpected Earnings

To examine the relationship between expected earnings and expected repairs and maintenance, it is also necessary to model earnings expectations. Earnings expectations are based on a random walk model applied to reported earnings before income taxes and repairs and maintenance (RE). Unexpected earnings (UE) is defined as

$$UE_{i,t} = (RE_{i,t} - RE_{i,t-1})$$

where UE is the change in reported earnings before income taxes and repairs and maintenance from last year to the current year. We use income before taxes since pre-

Table 1					
Descriptive Statistics for Sample Firms 1975-1990 (in millions of dollars)					
N=2,505	Mean	Std.Dev.	Quartile 1	Median	Quartile 3
Net Income	181.54	457.27	30.25	78.19	192.71
Repairs & Maintenance	137.49	345.51	19.55	52.33	131.70
Sales	3522.75	8536.85	695.81	1545.75	3638.90
Cash Flows	488.26	1182.74	89.17	210.53	486.03

196 Firms and 2,505 firm-year observations

Repairs and Maintenance from Supplemental Information to 10-K filing

Other Variables from Compustat Data: (1) Net Income (#18); (2) Sales (#12); (3) Cash Flows [Net Income (#18) + Depreciation (#14)].

tax income is often of concern to managers with accounting-based management compensation arrangements (Healy, 1985). We exclude repairs and maintenance from reported earnings since adjustments to repairs and maintenance can temper the size of unexpected earnings. Unexpected earnings are also scaled by gross plant, property, and equipment to control for firm size.

To test the relation between earnings expectations and repairs and maintenance adjustments, we employ several analyses. First, we employ a contingency table to examine the adjustments to repairs and maintenance in response to positive and negative unexpected earnings. Next, we divide the sample into deciles to see if the relation holds over the range of unexpected earnings. Finally, we pool the data to examine whether the relationship is linear (and constant) using ordinary least squares regression.

Results

Summary statistics for relative repairs and maintenance (RRM) and for unexpected earnings (UE) are reported in Table 2. For the full sample, relative repairs and maintenance are not significantly different from one. Mean

unexpected earnings are negative (-.008) although the sample of 2,505 is fairly evenly split with 1,357(1,148) firm observations having positive (negative) unexpected earnings. Variables were winsorized to the .95/.05 level to ensure that outliers were not driving our results. The effect of winsorizing is that no observations are deleted; outliers remain in the sample but are redefined at the .95 and .05 levels.

Contingency Table

To examine the directional relationship between unexpected earnings and relative repairs and maintenance expenditures, the sample is partitioned, based on the sign of the unexpected earnings, to examine differential responses of relative repairs and maintenance to unexpected earnings. An observed relationship between negative unexpected earnings and lower relative repairs and maintenance would be consistent with the hypothesis that management defers repairs and maintenance to help meet short-term earnings goals. Table 2 contains the empirical results of these tests. Relative repairs and maintenance moves in the direction of unexpected earnings. Positive unexpected earnings have a mean of

Table 2						
Relation Between Unexpected Earnings and Repairs and Maintenance						
	All Firms N=2,505		Positive UE Only N=1,357		Negative UE Only N=1,148	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Unexpected Earnings Before Income Taxes and Repairs and Maintenance (UE)	-.008*	.063	.043*	.036	-.052*	.046
Relative Repairs and Maintenance (RRM)	1.000	.142	1.055**	.136	.952**	.130
* significantly different from zero at the .001 level (two-tail for full sample, one-tail test for directional tests)						
** significantly different from one at the .001 level (one-tail test)						

UE = Unexpected Earnings

RE = Reported Earnings before income taxes and repairs and maintenance

R&M = Repairs and Maintenance Expense

Variables are scaled by Gross Property, Plant and Equipment

.043 while negative unexpected earnings have a mean of -.052. In each case, relative repairs and maintenance are in the direction hypothesized. When unexpected earnings are positive (negative), mean relative repairs and maintenance is 1.055 (.952) which is significantly greater (less) than one at the .001 level of significance. This implies that managers defer repairs and maintenance to later periods when earnings goals are not met, and make up necessary repairs and maintenance when the earnings target is achieved.

Analysis of Decile Partition

To examine whether this relationship is constant over the range of unexpected earnings, we further partition the total sample into deciles of approximately 250 firm year observations. Table 3 provides results based on deciles formed by partitioning based on the signed magnitude of unexpected earnings. The most negative unexpected earnings are in decile one and the most positive are in

decile ten. The results of this partitioning indicate a linear relation exists between unexpected earnings and relative repairs and maintenance. RRM is .913 for the first decile and increases to 1.090 for the last decile. RRM is in the direction hypothesized and is significantly different from one for all ten deciles at the .01 level.

Regression Model

Ordinary least squares analysis is performed to examine the linear relationship between earnings expectations and expenditures for repairs and maintenance for our aggregate sample. Panel A of Table 4 contains the results of the regression of relative repairs and maintenance on unexpected earnings for the full sample. The model is significant at the .001 level and has an adjusted R^2 of 14%. The coefficient on unexpected earnings is positive (.840) and statistically significant at the .001 level and is consistent with the hypothesis that repairs and maintenance decisions are adjusted to meet earnings expectations.

Table 3				
Relation Between Unexpected Earnings and Repairs and Maintenance (Analysis based on Deciles)				
Decile	N	Mean Unexpected Earnings (UE)	Mean Relative Repairs and Maintenance (RRM)	Standard Deviation of RRM
1	250	-.134	.913	.158
2	251	-.073	.947	.142
3	250	-.041	.949	.129
4	251	-.023	.960	.105
5	250	-.010	.971	.107
6	251	.001	1.026	.111
7	251	.013	1.025	.120
8	250	.028	1.035	.122
9	251	.054	1.081	.142
10	250	.104	1.090	.157

Full sample was partitioned based on unexpected earnings into deciles. The most negative unexpected earnings are in decile one while the most positive are in decile 10.

UE = Unexpected Earnings

RE = Reported Earnings before taxes and repairs and maintenance

R&M = Repairs and Maintenance Expense

Variables are scaled by Gross Plant, Property and Equipment

Table 4			
Regression Analysis of Relative Repairs and Maintenance (RRM) and Unexpected Earnings (UE) 1975-1990			
Model: $RRM_{i,t} = a_i + b_{1i}(\text{Unexpected Earnings}) + e_{i,t}$			
Panel A: Full Sample--2,505 Observations			
Variables	Parameter Estimates	T-statistic	p-value
Alpha	1.006	378.443	.0001
Unexpected Earnings	0.840	20.31	.0001
F-stat: 412.58, (p < .0001)			
Adj. R ² : .14			
Panel B: Positive Unexpected Earnings--1,357 Observations			
Variables	Parameter Estimates	T-statistic	p-value
Alpha	0.977	186.13	.0001
Unexpected Earnings	0.478	6.35	.0001
F-stat: 40.30, (p < .0001)			
Adj. R ² : .03			
Panel C: Negative Unexpected Earnings--1,148 Observations			
Variables	Parameter Estimates	T-statistic	p-value
Alpha	1.025	167.28	.0001
Unexpected Earnings	0.685	6.385	.0001
F-stat: 40.77, (p < .0001)			
Adj. R ² : .03			

UE = Unexpected Earnings

RE = Reported Earnings before taxes and repairs and maintenance

R&M = Repairs and Maintenance Expense

$UE_{i,t} = (RE_{i,t} - RE_{i,t-1})$

$RRM = (R\&M_{i,t}/R\&M_{i,t-1})$

The relationship may not be constant over positive and negative unexpected earnings. Managers may cut back on repairs and maintenance to meet earnings goals but may not exhibit behavior consistent with increasing repairs and maintenance when earnings goals are exceeded. To examine positive and negative unexpected earnings separately, we run separate regressions for positive and negative unexpected earnings. Panels B and C of Table 4 provide the results of these two regressions. For the 1,357 observa-

tions with positive unexpected earnings, the coefficient on unexpected earnings is positive (.478) and significant at the .001 level. Similarly, for the 1,148 observations with negative unexpected earnings, the coefficient is also positive (.685) and significant at the .001 level. The results are consistent with decisions to alter repairs and maintenance expenditures in an attempt to meet earnings objectives regardless of the sign of the deviation. The results of the regression analysis support and reinforce our prior analyses.

Additional Analysis

We examined the relationship between unexpected earnings and relative repairs and maintenance for each year (over the 1975-1990 period) and by industry (based on 1-digit SIC code). The results (not reported) indicate that our findings are not affected by any particular year nor by any particular industry. The results are consistent across years and across industries.

We also examined cash flows to determine if decisions to defer repairs and maintenance were driven by cash constraints rather than by the desire to meet earnings expectations. While the mean change in cash flows was negative for firms with negative unexpected earnings, we found that the majority of firms continued to have positive cash flows. Thus, repair and maintenance decisions are not likely to be constrained completely by economic conditions.

Conclusions

The findings of this study are consistent with the hypothesis that managers make repairs and maintenance decisions to meet earnings expectations. We also find evidence that deferrals of repairs and maintenance are reversed when earnings changes are positive. The fact that we find increased repairs and maintenance when earnings increase lead us to conjecture that perhaps management does not treat repairs and maintenance as a completely discretionary expense, but rather as a deferral of necessary expenditures to keep the plant and equipment operational. Of concern, of course, is the ultimate cost of deferring necessary repairs and maintenance.

Suggestions for Future Research

Our results indicate that management defers repairs and maintenance expenditures when reductions in current expenses are necessary to meet earnings goals for the year. The results also suggest that at least some of the deferred maintenance is "made up" in years in which projected earnings exceed targets. There may be a cost to this strategy, even if the deferred repairs and maintenance are fully funded in later years. A study identifying the economic costs of deferred repairs and maintenance would be an extremely interesting extension of this research, with potential implications for the accounting policy decision allowing nonaccrual of deferred maintenance.

This study also adds another component to the portfolio of accounting and operating choices that accounting research has shown to be related to earnings management. Future studies of individual components are certainly appropriate, particularly when the environment provides

an economically or ethically significant issue. But we have probably also reached the stage where examination of the portfolio is in order. This research may, initially at least, try to identify the importance of the various components in a sample of earnings management situations.

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*** Footnotes ***

1. New York Times, April 19, 1992.
2. Regulation S-X governs disclosure of repairs and maintenance. If repairs and maintenance exceed 1% of sales, disclosure on Schedule X, Supplemental Income Statement Information of the Form 10-K is required.
3. We also modeled expected repairs and maintenance using a regression model based on the age of the property, plant and equipment, and past repairs and maintenance expense. Prior year repairs and maintenance explained over 90 percent of the variation in current repairs and maintenance and justified our use of a more parsimonious model.

*** References ***

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