JOURNAL OF THE TRANSPORTATION RESEARCH FORUM

Volume XXX Number 2 1990

TRANSPORTATION RESEARCH FORUM

Viability Measures Applied To Iowa Shortline Railroads

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ABSTRACT

The state of Iowa lies in the rail corridor from Chicago to the West. Its rail system totals 5,000 miles but also spans a range of railroad health from busy mainline and reborn shortline to bankruptcy and abandonment.

This study demonstrated the use of financial data reported to a state transportation agency to calculate, for each of twelve shortline railroads, ratios that became the inputs to viability vs. bankruptcy models described in the literature. The calculated and graphed outputs provide indications of the economic viability of the railroads. The results will be useful to government, investors and shippers in identifying firms that require financial assistance and those that may become viable investments.

INTRODUCTION

Very few issues discussed in Iowa elicit as many opinions as the current condition of the railroads. This holds true for a variety of reasons, including historical growth, recent curtailment of services and track, and changes in ownership. The question of what will happen next is a natural outgrowth of these changes. This paper describes applications of established predictor models and criteria to the financial records of shortline railroads operating in Iowa in an attempt to identify the more likely survivors.

The focus of this paper was the Class II (annual revenues less than $88.6 million) and Class III (revenues less than $17.7 million) railroads. These non-Class I lines have been further defined by the Association of American Railroads as "regional" (more than 350 miles of track or more than $40 million in freight revenues) or "local" (Wolfe, 1989c, p. 26). Shortlines are sometimes the result of prior abandonments or bankruptcies, and often are perceived to have financial problems. The Iowa Department of Transportation (IDOT) had recently strengthened its efforts in collecting financial and operating data from these shortline carriers. The initial detailed reports from 1986 were provided for this analysis.

BACKGROUND

History

The development of the state paralleled the development of the rail network. As far back as 1878, Iowa had well over 4,000 miles of track with a population of only 1.5 million people. By 1900, Iowa could boast 9,200 miles of rail with a population of 2.25 million (IDOT, 1973, p. 7). Rail lines had more than doubled in the short 22-year span between 1878 and 1900. Railroads were not having a carefree existence even during this time period. In 1886 the Wabash decision established federal responsibility for railroad regulation (IDOT, 1973, p. 11). This decision, asserting that state commissions could not regulate interstate transport, reduced the effect of state agencies until the early 1970's. Problems arose when the moods of both the federal government and railroads changed to favor abandonment. Iowa did not have an agency structure that was prepared to "examine and assess the broad scale impact of a localized abandonment" (IDOT, 1973, p.12). Thus, only recently has Iowa begun to grasp and handle the issue of abandonment within its boundaries.

The 1970's were truly a turning point for the rail industry in both Iowa and the rest of the U.S. From 1930 to 1970, the basic policies of the ICC had been "anti" abandonment toward rail lines with more than "negligible" traffic. Due (1987) cited a series of events which occurred in the U.S. rail system that changed this prevailing attitude. First, the collapse of the Penn Central brought about the Regional Rail Reorganization Act (3R Act) of 1973. Next, the Railroad Revitalization and Regulatory Reform Act of 1976 (4R Act) was passed. This act "systemized" the abandonment process. Finally, the Staggers Act of 1980 created major changes in the "procedures of abandonment" (Due, 1987, pp. 21-22). This act stated that the ICC was no longer required to hold investigations in all abandonment cases. It also gave the ICC a more relaxed attitude toward abandonments. More importantly, the burden of proof now rested on protestants in abandonment cases.

The Staggers Act brought much needed relief to many railroads; however, it brought many problems to Iowa. Iowa has many rural communities, and abandonments can be a serious threat to the existence of these communities. After attaining over 11,642 miles of track by the end of 1973, Iowa started a decline of almost startling proportions (Council of State Governments, 1976, p. 1). According to the state's Department of Transportation, by 1984 Iowa was down to 5,014 route miles (IDOT, 1986, p. ii). This was a loss of nearly three-fifths of Iowa's rail lines and 2,400 miles of the loss had been since 1980 (Schmidt, 1988).

Iowa's railroads have gone through great changes in the post-Staggers environment. One of the main forces behind these drastic changes may lie with the attitude of the Federal Railroad Administration (FRA) toward Iowa. The FRA regards only 1,800 miles of Iowa rail line as being of "national interest" (Class A) or "multistate interest" (Class B) (Schmidt, 1988, p. 1C). The FRA probably will not worry overly much about abandonments unless they affect Class A or Class B lines in the state.

Shortlines

A working solution to the dilemma of some line abandonments has been the development of shortline railroads. Class I carriers could not operate very successfully on these lines, so they opted for selling them instead of abandoning them. Regional and local rails have certain advantages over their Class I counterparts that may make them more successful. First, shortlines have lower costs on the lines they serve and can therefore operate more profitably (Heffner, 1983, p. 68). Stratton (1985, p. 73) explained the shortlines' advantages of flexibility as:

> "The ability to use a more personal approach in tailoring and marketing services to shippers, and cost savings gained from such practices as the use of non-union labor and "split-splitting" (work rules that allow employees to perform a variety of tasks)."

Next, shortlines can adjust their service to cater to the specific shippers they serve. Finally, Due (1986, pp. 23-25) suggested shortlines have more shipper support because their mutual "good health" insures a "longer life" in the competitive markets. A major reason why these lines became unprofitable for Class I carriers was the development of motor vehicles which "chipped away" pieces of the rail traffic (Due, 1986, p. 2). Shortlines, because of their inherent advantages, can be more competitive with other modes of transportation. A question that some are beginning to ask is whether "more competitive" is good enough to sustain even shortline carriers?

Shortline railroads have some limitations that must be overcome if they are to be "good enough" to compete with other modes on a long-term basis. It is very hard for many shortline railroads to attain economies of scale in operations when dealing with repair, replacement, and fuel costs. Due addressed these and other issues that can lead to shortline failures, such as low traffic volume, lack of funds, or management inadequacy, among others (Due, 1986, pp. 25-26).

Shortlines are not as constrained by union rules or pay scales as Class I carriers traditionally are, differences that have helped make short lines more viable. However, the recent Pittsburgh & Lake Erie Railroad Co. (P&LE) vs. Railway Labor Executives' Association case brought sales of short lines to a virtual halt (Abramson, 1989), falling from 46 in 1987 to 9 in 1988 (Wolfe, 1989, p. 28). A pending sale to the Chicago West Pullman Corporation was challenged, both in District Court and by a strike, under the provisions of the Railway Labor Act regarding the altering of working conditions. Although the Interstate Commerce Commission (ICC) then exempted the P&LE from the job protection requirements usually imposed when a railroad is sold, the federal court judge said the railroad had to make the unions a part of the negotiation process in its sale. In June, 1989 the U.S. Supreme Court overturned the injunction, ruling 5-to-4 that management may shut down without the approval of labor. However, the court said that the lower court should have tried to "harmonize" the provisions of the Railway Labor Act and the Interstate Commerce Act. This outcome means that the railroad may be required to bargain with employees over their effects from a proposed sale, but the sale need not be postponed (Wermeil, 1989) and the "obligation to bargain ceases once the sale is completed" (Greenhouse, 1989). The non-definitive nature of the ruling, coupled with the close vote by the Supreme Court justices, probably did not represent a precedent that will trigger additional sales of shortlines. A stronger future statement may have further reaching impacts, particularly in states such as Iowa which have the potential for additional shortline sales (Petroski, 1988).

Iowa's Shortlines

According to the 1986 reports, fourteen Class II and III railroads existed in Iowa; they are listed in Table 1. Altogether, these railroads contributed $12,594,661 in wages and benefits (IDOT, 1987).

The uneven distribution of size should be noted. The two largest lines, the Chicago

TABLE 1

Iowa Shortlines: Descriptive Statistics

Railroad	Graph symbol	Total route miles	1000 rev ton-mi per mile	$1000 operating revenue
Class II				
Chicago Central and Pacific	CCP	531	204	56,720
Class III				
Iowa Interstate	II	539	1,116	15,956
Cedar Rapids and Iowa City	CRIC	50	599	11,037
Cedar Valley	CV	129	383	2,653
Iowa Northern	IN	141	272	2,161
Dakota and Iowa	DI	128	581	1,992
Des Moines Union	DMU	4	N/A	1,758
Keokuk Junction	KJ	5	N/A	701
Colorado and Eastern	CE	9	N/A	464
Iowa Terminal	IT	9	26	191
Davenport, Rock Island and North Western	DRI	44	N/A	131
Burlington Junction	BJ	2	N/A	92
Appanoose County	AC	10	11	72
Kewash	K	14	0	0

Source: Iowa Department of Transportation, Rail and Water Division. (1986 December 31). "Annual Report(s) For Class II and III Railroads," Author.

Central and Pacific (CCP) and the Iowa Interstate (II), owned 74 percent of the track and originated and terminated 80 percent of the tons of freight. The top three--the CC&P and II plus the Cedar Rapids and Iowa City (CRIC)--accounted for $11,194,820 or 89 percent of the wages and benefits paid. These three also accounted for 84 percent of the Iowans employed by Class II and III railroads.

At the other extreme, six of the lines were essentially switching companies, running from zero to ten miles of track. One of the reports was for the Kewash Railroad, a company that stopped running in 1986.

As the Class I carriers become more competitive, more lines are likely to be abandoned or sold if they do not meet certain standards of profitability. The recent conflicts between the Chicago and North

Western and the Iowa DOT are indicative of this attitude. Obviously, Iowa needs many of its rail lines, but does it need them all? The major grain routes would appear critical, as one unit train of 100 cars hauls the same amount as 387 trucks (Petroski, 1988). The question of viability becomes important when looking beyond the lines which must be served by Class I railroads. The other rail lines will be either abandoned or picked up by local interests. At present there are no other solutions that will make these secondary lines profitable enough to be sustained by the Class I railroads.

METHODOLOGY AND APPLICATION

Attributes of successful and failed railroads have been identified by Sidhu, Charney and Due (1977), by Due (1984), and by Wolfe (1988). Comparing the current local data with these published profiles formed one means of judging the financial health of the Iowa shortlines. Altman's Z-score models provided another method for predicting the failure or success of these firms.

Density-Based Criteria

Based on a cost analysis of Class II lines and the costs of transferring their freight to a Class I line or to trucks, Sidhu, Charney, and Due (1977, p. 21) provided a set of generalizations about traffic density and economic justifiability:

(a) Lines with traffic less than 50,000 ton miles per mile typically have costs over 25 cents per ton mile and are likely to be justifiable only if the line is very short--under 10 miles--or special conditions allow very infrequent service, make truck costs or transferto-truck costs unusually high, or from a profit standpoint, allow an unusually high freight rate.

(b) Roads with traffic between 50,000 and 200,000 ton miles per mile may be justifiable, depending on the main line haul, length of the line, and the ability to hold costs down.

(c) Roads with traffic between 200,000 and 800,000 ton miles per mile and under 25 miles in length of haul are almost certain to be economically justifiable unless cost of transference from truck to rail is very low or main line haul is very short.

(d) Roads with traffic over 800,000 ton miles per mile are likely to be economically justifiable even without a main line haul.

Charney, Sidhu, and Due (1977, p. 357) stressed the responsiveness of costs to changes in traffic: since marginal cost was below average cost, increased volume would lower average cost, often substantially.

Comparing the traffic densities from Table 1 with the above criteria, only the Iowa Interstate was in category (d) and considered most likely justifiable. Five lines fell into the density ranges of category (c) but all exceeded the length guideline of 25 miles. In effect, these railroads had the traffic density of shortlines but the length of mainlines. Additional revenues would be necessary to maintain the many miles of track. Finally, three firms were in the (a) category; their low densities made them more difficult to justify, although they were within the guideline route limit of 10 miles. (The sample was limited because traffic density data was not furnished in all reports submitted.)

Causes of failure of new railroads companies were reported by Due (1984, p. 38). Heading the list, and confirming the earlier emphasis on density, was inadequate traffic. Other causes were physical problems, including bridge safety and bad track, management problems, and lack of shipper support.

The most comprehensive discussions of service failure prediction models for local and regional railroads have been published recently by Wolfe. Using 120 variables representing liquidity, efficiency, leverage, profitability, and other factors, Wolfe (1989a, 1989b) compared failed and successful railroads during a 15-year period. He identified 23 variables that were statistically significant (at levels ranging from the .01 to .10 levels) and developed profiles of failed and successful rails.

For example, Wolfe calculated the average density of failed locals and regionals as 167,000 ton-miles per mile while successful roads averaged 304,000. His findings were fairly consistent with the criteria list developed by Sidhu, Charney and Due and helped to clarify their very broad category (c), which ran from 200,000 to 800,000 ton-miles per mile. As shown in Table 1, four Iowa shortlines reported densities higher than Wolfe's average for successful line. The density for a fifth railroad was closer to the successful average than to the average for failed companies.

Wolfe (1989b, p. 17) graphically demonstrated differences between success and failure for density and for the four additional measures shown below:

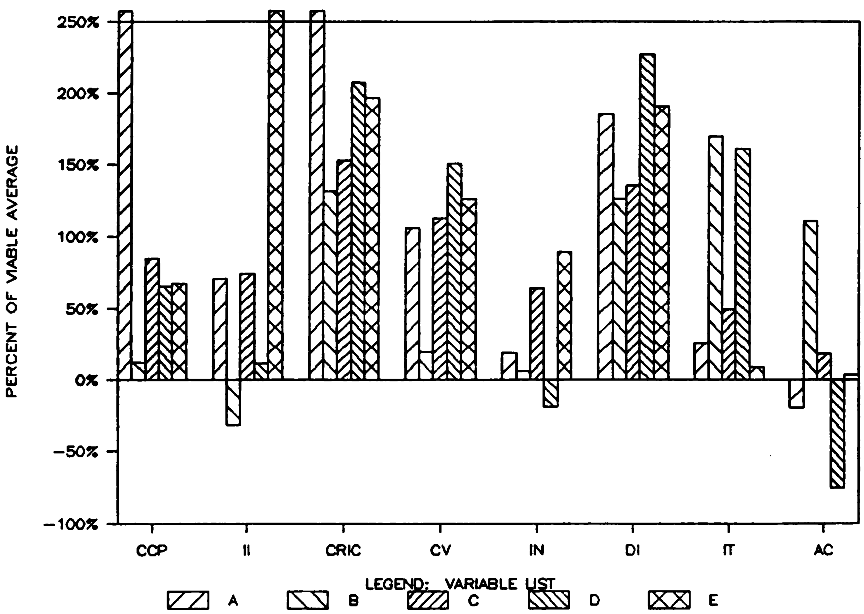
A. Cash Flow ($144,000, $602,000 in 1986 dollars)
B. Total Debt/Total Assets (.73, .43)
C. Operating Ratio (4.18, .72)
D. Earnings Before Taxes/Total Assets (.03, .14)

E. Density (167,000, 304,000 ton-miles per mile)

The bar graph in Figure 1 was based on each shortline's relative positions as percentages of the above listed averages, labeled A through E, for successful railroads. For ease in comparing individual firms and variables, it was considered preferable to have financially stronger positions displayed by positive indices. For example, the ratio of total debt to total assets was restated as equity to total assets; the ratios became 1 minus debt/assets or .57 for the successful firms. The operating ratio was likewise restated as the inverse, or revenue to operating costs, with an average of 1/.72 or 1.39. Variables representing cash flow, earnings, and density (labeled A, D, and E) had the desired positive orientation.

FIGURE 1

Iowa Shortlines vs. Wolfe's Averages



Inspection of Figure 1 suggests that the Cedar Rapids and Iowa City and the Dakota and Iowa appear healthier than the average successful railroad in all five measures. The Appanoose County, Chicago, Central and Pacific, Iowa Interstate, and Iowa Northern were noticeably weaker than the successful averages in four or more categories.

Altman's Bankruptcy Analyses

Background. The above discussion was based on arbitrarily selected and equally weighted variables. A review of bankruptcy predictor models suggested that the weights assigned each variable be determined more analytically. (The converse of the likelihood of going out of business may be interpreted as a viability measure; predicting firms that are candidates for bankruptcy thus also predicts the viable firms.) One method cited was discriminant analysis, which was applied to predicting corporate bankruptcy by Altman. He was described by Platt as the "father of modern bankruptcy analysis" (Platt, 1985, p. 89). The application of discriminant analysis to predict corporate bankruptcy was developed by Altman. Discriminant analysis uses independent variables, such as financial ratios, to classify objects or cases into several categories. The mathematical details resemble multiple regression, with a discriminant score (Z) being produced from a linear function of the independent variables:

$$Z = v_1 x_1 + v_2 x_2 + \ldots + v_n x_n$$

where:

v_i = discriminant coefficient for the i^{th} variable, calculated by the discriminant analysis program,

x_i = independent variables; e.g., financial ratios.

The financial ratios used as the independent variables were described by Platt (1985, p. 85) as the following:

Liquidity: the firm's ability to meet current liabilities
Debt: how the firm is financed
Activity: how effectively assets are used
Profitability: compares profits to sales, assets, and investments
Growth: where the firm is going
Value: how the firm is judged by the market

The studies by Altman tested a variety of these ratios as inputs to the discriminant function. His Z-score models selected a discrete number of inputs that provided the best predictability, based on correctly classifying firms as bankrupt-prone and viable, while minimizing Type I and Type II errors. (A Type I error would be classifying a firm as viable but it goes bankrupt; a Type II error would be predicting a firm's demise that does not happen.)

Altman's 1968 article described tests of financial ratios from 33 firms that had gone bankrupt since 1946 and 33 firms still existing twenty years later. Using data from one year prior to bankruptcy, Altman's discriminant model correctly assigned firms to the correct category, bankrupt or non-bankrupt, in 95 percent of the cases. The percentage of correct assignments was reduced when longer term prediction was made. For example, 72 percent of the bankrupt firms would have been predicted two years before filing (Altman, 1968, pp. 589-609).

Altman (1973, pp. 192, 206) turned to the railroad industry and collected the financial data from 21 railroads that had gone bankrupt between 1939 and 1970. His discriminant analysis techniques correctly classified the rail firms 97 percent of the time both one and two years prior to bankruptcy. Altman's methodology was revised in a 1977 article (Altman, Haldeman, and Narayanan, 1977) and expanded in a 1983 book. A thorough discussion of failure-prediction models was included in a text by Altman, Avery, Eisenbeis, and Sinkey (1981, pp. 255-306). More recent applications include Altman and Gritta's (1984) airline analysis, Chow and Gritta's (1985, 1988) predictions of motor carrier bankruptcies and a savings and loan failure study by Pantalone and Platt (Platt, 1985, p. 138).

Altman's Z-score Model – Altman's (1973, p. 195) original railroad discriminant model included seven independent variables. They were:

1. The ratio of cash flow to fixed charges (Cash Flow/Charges), which shows the railroad's ability to meet its fixed charges.

2. The ratio of transportation expenses to operating revenues (TE/OR), which shows how efficiently the railroad is operating.

3. The ratio of retained earnings to total assets (RE/TA), which measures the railroad's cumulative profitability.

4. The three-year growth rate in operating revenues, which measures the effects of insufficient revenues.

5. The ratio of earnings after taxes to operating revenues (EAIT/OR), which measures one-year earnings performance.

6. The ratio of operating expenses to operating revenues (OPERATING RATIO), which also measures one-year earnings performance.

7. The ratio of earnings before interest and taxes to total assets (EBIT/TA), the final measure of one-year earnings performance.

The resulting discriminant model became:

$$Z = .2003(X1) - .2070(X2) + .0059(X3) - .0647(X4) + .1040(X5) + .0885(X6) + .0688(X7)$$

where X1 through X7 were the financial ratios described above. In Altman's study (1973, p. 199), railroads that went bankrupt had Z-scores below -1.465. Conversely, Z-scores above this cutoff point would have predicted a viable railroad.

The financial ratios for twelve Iowa shortline railroads were entered in the Z-equation. (Data for the Des Moines Union and the Kewash were too incomplete to be applied.) Some modification was required for missing entries. First, the three-year growth rates were not available. The industry average, 3.9 percent, reported by Altman was substituted to maintain consistency with the original Z-scores and among firms in the sample. Second, Altman's railroad industry average of 2.33 was substituted for the cash flow-to-fixed charges in five cases with fixed charges indicated as zero. The resulting Z-scores are tabulated in Table 2 and displayed in Figure 2; the symbols identifying the railroads in the graph are also listed in Table 2.

TABLE 2

Z and Z" Scores

Railroad	Z-Scores	Rank	Z"-Scores	Rank
<u>Class II</u>				
Chicago Central and Pacific	0.141	8	0.215	9
<u>Class III</u>				
Iowa Interstate	0.139	9	-0.778	11
Cedar Rapids and Iowa City	0.463	4	11.621	1
Cedar Valley	0.418	5	1.794	6
Iowa Northern	0.084	10	-0.807	12
Dakota and Iowa	0.484	3	7.364	3
Keokuk Junction	0.381	5	9.028	2
Colorado and Eastern	-0.444	11	-0.106	10
Iowa Terminal	0.372	7	4.293	4
Davenport, Rock Island, and North Western	2.442	1	1.074	7
Burlington Junction	1.238	2	3.149	5
Appanoose County	-0.791	12	0.782	8

According to these calculated Z-scores, but in contradiction to general perceptions of the industry, none of the railroads tested were candidates for bankruptcy in 1986. That is, all values for Z were above the -1.465 cutoff level in Altman's railroad study. The two strongest lines, by this measure, were the Davenport, Rock Island and North Western and the Burlington Junction. The Appanoose County and the Colorado and Eastern railroads were the weakest but still above the critical Z-score. The other scores were in a relatively narrow range.

Altman's Z" Model – This variant of the Z model uses the four financial ratios described below (Altman, 1983, pp. 120-124). It was successfully applied by Chow and Gritta (1985) to successfully predict 85 percent of bankrupt motor carriers. Wolfe (1989a, p. 25) described the Z" model as "the best of the public domain models." The equation was:

$$Z'' = 6.56(X1) + 3.26(X2) + 6.72(X3) + 1.05(X4)$$

where X1 to X4 were:

1. The ratio of working capital to total assets (WC/TA), a liquidity measure.

2. The retained earnings to total assets ratio (RE/TA), to measure accumulated past profitability.

3. The ratio of earnings before interest and taxes to total assets (EBIT/TA), which is also a profitability measure.

4. The ratio of the book value of equity to the book value debt (BVE/BVD), a gauge of financial leverage. Altman's Z"-scores of 2.60 or more indicated firms having a strong financial position; a Z"-score of less than 1.10 indicates a very weak position. He considered scores in between as a "zone of ignorance" and susceptible to errors in classification (Altman, 1968, p. 606).

The four ratios for each of the Iowa shortlines tested above were inputs to the Z" equation. The resulting values appear in Table 2 and their relative positions are displayed in Figure 3. A problem similar to that described above was encountered for the D&I and ITR lines that did not include a debt amount, required for the equity-to-debt ratio (X4). As before, a substitution was made using the railroad industry average, .98, from the Altman study. This value was most conservative because the average equity to debt ratio of the other shortlines was 1.6. Another calculation (not shown) using the higher ratio gave somewhat greater Z"-scores but did not alter the ratings of the two firms. A much higher ratio--which may have existed if the debt were truly zero--would have resulted in abnormally high Z"-scores. Altman's Z"-score method might benefit from a revision to include a different leverage ratio, such as debt to total assets, to avoid this problem.

This discriminant equation appears to have spread out the firms' scores more widely than the Z-score application. The Cedar Rapids and Iowa City, Keokuk Junction, and the Dakota and Iowa railroads appeared the strongest. The Iowa Terminal and Burlington Junction lines were also rated strong, although they were closer to the cut-off. The Cedar Valley Z"-score fell into the mid-range and the remaining railroads were rated as weak.

Notable was the lowest score of the Iowa Interstate, the line that had the highest traffic density. (Iowa Interstate's Z-score in the first test was third from the bottom.) This apparent contradiction may have been due to the nature of the measures used: Altman's analysis used financial ratios exclusively to predict financial condition. It is also logical to assume that traffic density is an indicator of the revenue generating capacity of a line. However, a railroad's viability will also be very much dependent upon its cost structure, a factor more directly acknowledged in the Altman input variables.

While testing one year's data may not be a sufficient base to judge predictability, the ratings in Table 2 tended to match public perceptions of these shortlines. One firm rated "weak," the Chicago Central and Pacific, did file for bankruptcy in 1987 but emerged without disruption in service (Borzo, 1987). The Iowa Interstate was approved by a state agency to receive a grant and a no-interest loan ("State Transportation," 1987); its Z"-score would appear to have substantiated the need for support. Further use of the tested method might assist state officials in determining other recipients of public funds.

Wolfe's W4 Model – After discussing previous financial modelling work, Wolfe developed proprietary discriminant models especially for local and regional railroads. His "W4" model displayed greater failure predicting accuracy than Altman's Z" model. Three variables were employed:

A. Operating Revenue/Total Assets
B. Transportation Expenses/Transportation Revenues
C. Miles of Track Operated

This combination of activity and profitability ratios, coupled with the facility measurement, may have alleviated some of the problems encountered in applying existing data to the Altman models. Wolfe (1989a, p. 7) cautioned that the outputs "should not be used in isolation to assess L&R railroad viability, but must be evaluated in conjunction with other information and circumstances."

Discussion and Limitations – Why did the Z" results appear better suited than Altman's railroad model for analyzing the prospects of Iowa shortlines? The effects of changing regulations, especially the Staggers Act of 1980, may have provided shortlines with financial structures that resemble those of corporations in general, rather than the older Class I railroads. The recently established shortlines were not newly constructed but were purchased at distressed prices; thus their smaller capital bases were not typical of railroads but appeared more like those of other industries. Some had little or no debt because such financing was not available to these ventures. Other lines were sponsored by larger railroads whose ownership was reflected by equity and switching payments, rather than debt. Wolfe (1989a, p. 26) noted that local and regional railroads were more similar to the firms used by Altman in his Z" model than to the Class I railroads in his earlier model. Altman's (1977, p. 30) reasons for constructing new models included changes in size and financial profiles of business failures, changes in accounting practices and reporting, and the temporal nature of the data.

The substitution of industry averages for missing data also forced some Z-scores toward the midpoint, thus decreasing their discriminating ability. The original equation contained seven variables, some of which were highly correlated with each other (Altman, 1973, p. 197). Also, the sixteen years that have elapsed since the original paper may be viewed as a detriment, although Altman's

FIGURE 2

Altman's Railroad Z-Scores

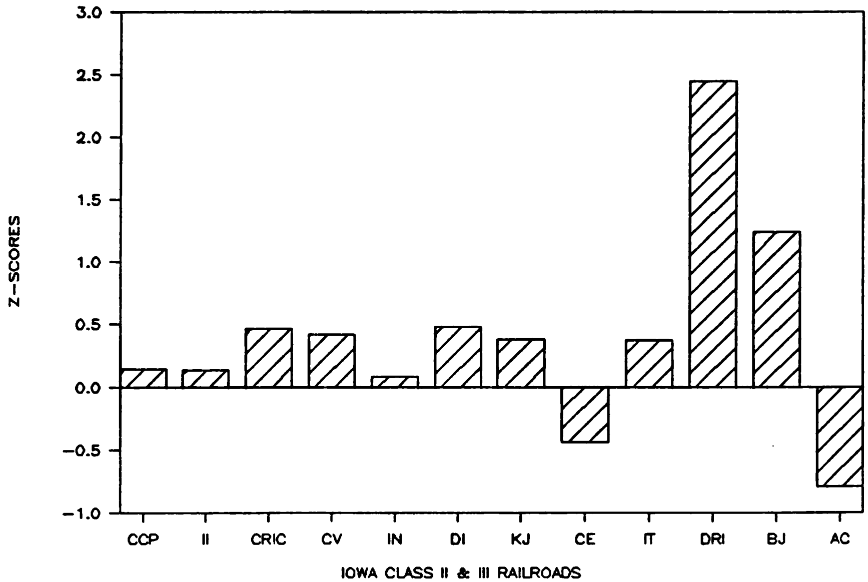
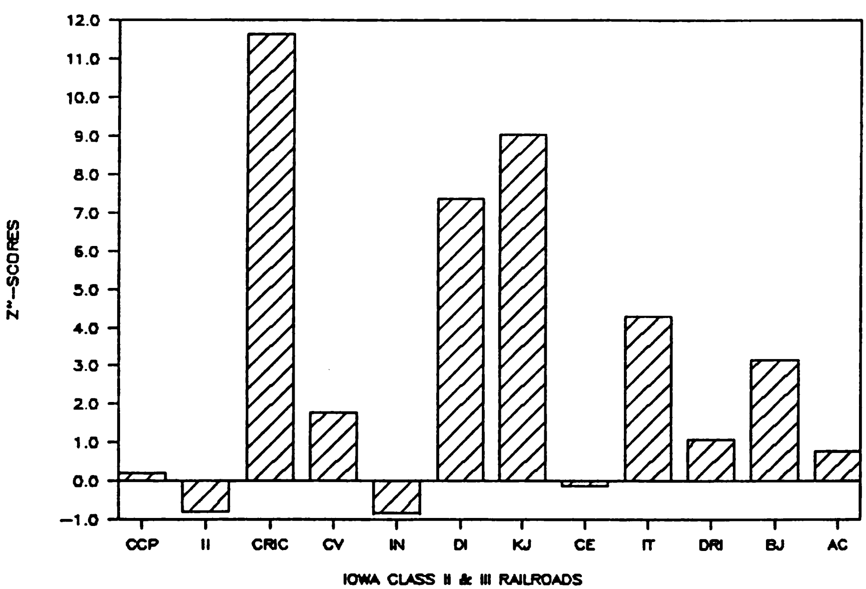


FIGURE 3

Altman's Revised Z"-Scores



original study was based on data collected over a period twice that long.

There are distinct limitations of attempting to predict viability or bankruptcy with the methods described above. The data may be incomplete, as demonstrated in several cases above, or may not be accurate. Annual data are static and cannot indicate changes made since its filing. More serious may be the limited time frame provided in which to judge financial health. Platt (1985) cautioned:

> The better studies–those able to exceed chance–seem to predict failure successfully only within two years of corporate failure. Three years before the crisis, the financial ratios of companies that will fail and those that will survive are not statistically different. To be useful, then, the models need to be rerun on a regular basis.

Platt's last statement should be accepted as a recommendation to those who determine policies affecting the creation and support of shortline railroads. To the extent that the Z"-scores and corresponding ratings are accurate, over one-half of the shortlines tested in Iowa were in weak financial condition; their viability may appear doubtful.

CONCLUSIONS

The future of Iowa's railroads may lie with its regional and shortline carriers. This paper has presented a brief background of the state's Class II and III railroads and then applied their reported traffic density and financial data to the criteria and models reviewed to predict bankruptcy vs. viability. Based on this one-time application, the railroads were labeled as being financially strong, medium or weak.

In addition to analyzing existing shortlines, the pro forma financial statements of proposed lines could provide the inputs necessary for the Z" model, enabling direct comparison with others members of the industry. Sponsors of new shortlines would thus be better advised about the potential viability of their ventures. Capital structures that carry inherent risk could likewise be avoided.

It was cautioned that the predicting abilities of the models were limited in their time scope. While the calculations described above should be updated as more timely data become available, investors and policy influencers alike should benefit from this application of Altman's analysis. The results provided indications of financial strengths and weaknesses not previously available.

REFERENCES

Abramson, H.S. (1989, June 22). Short-line decision disappoints rail. *Journal of Commerce*, pp. 1A, 10A.

Altman, E.I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *Journal of Finance, 23*, 589-609.

Altman, E.I. (1973, Spring). Predicting railroad bankruptcies in America. *Bell Journal of Economics and Management Science*, 4(1), 184-211.

Altman, E.I. (1983) *Corporate Financial Distress.* New York: Wiley.

Altman, E.I., Avery, R.B., Eisenbeis, R.A., & Sinkey, J.F., Jr., (1981). *Application of Classification Techniques in Business, Banking, and Finance.* Greenwich, CT: JAI Press.

Altman, E.I., and Gritta, R.D. (1984). Airline bankruptcy propensities: A Zeta^R analysis. *Proceedings of the Transportation Research Forum*, 25, 150-154.

Altman, E. I., Haldeman, R., & Narayanan, P. (1977, June). Zeta analysis: A new model to identify bankruptcy risk of corporations. *Journal of Banking and Finance*, 1(1), 29-54.

Borzo, G. (1987, September 7) C C & P files for reorganization. *Traffic World*, pp. 4-5.

Charney, A.H., Sidhu, N.D., & Due, J.F. (1977). Short run cost functions for class II railroads. *Logistics and Transportation Review*, 13, 345-359.

Chow, G., & Gritta, R. (1985). Motor carrier bankruptcy: An industry assessment of financial condition. *Proceedings–Twenty-sixth Annual Meeting*, Transportation Research Forum, pp. 434-440.

Chow, G., & Gritta, R.D. (1988). Estimating bankruptcy risks facing class I and II motor carriers: an industry-specific approach. *Transportation Practitioners Journal*, 55, pp. 352-363.

Council of State Governments. (1976). *Railroad Rehabilitation.* Des Moines, IA: Author.

Due, J.F. (1984). New railroad companies formed to take over abandoned or spun-off lines. *Transportation Journal*, 24(1), 30-50.

Due, J.F. (1987a). Abandonment of rail lines and the smaller railroad alternative. *Logistics and Transportation Review*, 23, 109-134.

Due, J.F. (1987b) *Small Community Rail Service.* Urbana-Champaign: University of Illinois.

Greenhouse, L. (1989, June 22). Supreme court roundup. *New York Times,* p. 10.

Heffner, J.D. (1983, January 31). Shortline railroads. *Traffic World,* pp. 68-73.

Iowa Department of Transportation. (1973). *Iowa State Highway Commission Report.* Ames, IA: Author.

Iowa Department of Transportation. (1986). *Iowa Rail Plan.* Ames, IA: Author.

Iowa Department of Transportation. (1987). *Class II & III Railroads: 1986 Statistics.* Ames, IA: Author.

Petroski, W. (1988a, February 7). Iowa rail system at a crossroads. *Des Moines Register,* p. G1.

Petroski, W. (1988b, February 24). Ruling threatens CNW sale; meeting halted. *Des Moines Register,* p. 5S.

Platt, H.D. (1985) *Why Companies Fail.* Lexington, MA: D.C. Heath.

Schmidt, J. (1988, April 10). Where have all the railroads gone? *Des Moines Register,* p. 1C.

Schuler, H.J. (1979). A decision model for subsidizing unprofitable rail properties: A case study and comparison. *Logistics and Transportation Review,* 15, 643-658.

Sidhu, N.D., Charney, A., & Due, J.F. (1977). Cost functions of class II railroads and the viability of light traffic density railway lines. *Quarterly Review of Economics and Business,* 17(3), 7-24.

State transportation news. (1987, October 12). *Traffic World,* p. 25.

Stratton, J.J. (1985). Short-line railroads. In J.W. Fuller (Ed.), *Financing Railroads in Iowa* (pp.70-81). Oakdale, IA: Legislative Extended Research Assistance Group.

Wermeil, S. (1989, June 22). Railroads win big leeway to sell assets. *Wall Street Journal,* p. B8.

Wolfe, K.E. (1989a). Financial and demographic conditions associated with local and regional railroad service failures. *Transportation Quarterly,* 43(1), 3-28.

Wolfe, K. E. (1989b). Long-run financial and demographic differences between failed and successful local and regional railroads. *Journal of the Transportation Research Forum,* 28(3), 13-23.

Wolfe, K.E. (1989c, February) What's the prognosis for local, regional railroads? *Modern Railroads,* pp. 26-30.

ENDNOTES

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