

COMMENT: SOLVENCY AND FINANCIAL STRESS IN AIR TRANSPORTATION

BY
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Introduction

In the wake of the Penn-Central collapse, increasing attention is being directed at the dangers of corporate bankruptcy and in particular at financial stress in regulated industries. With stock prices abnormally depressed and with interest rates at record levels, many firms have found it increasingly difficult to meet growing demands for necessary financing. Many are rapidly approaching unsound financial structures in this harsh economic environment. This is particularly true in air transportation, and the situation could pose very real problems in the near future.¹ Given the catastrophic effects of such events as Penn-Central, a better method of gauging financial health and the likelihood of insolvency in air transportation is needed. This paper is addressed to this need.

Research in the prediction of financial success or failure is still largely in the developmental stage. Newer attempts at designing predictive models have usually taken the form of traditional ratio analysis combined with statistical tools.² This paper applies one such model to the U.S. Domestic airlines in an effort to appraise their financial strength. The purpose is to assess their solvency and to demonstrate the industry's very fragile present financial condition. As a corollary, this paper will seek to identify the reasons behind the industry's poor financial performance. Possible solutions will be explored in the conclusion.

The Altman Model:

Financial analysts have long sought to identify key ratios that measure financial strength. Edward Altman has isolated *five* such important mea-

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1. Pan Am, TWA, and Northeast have all had to deal with a liquidity crisis. Northeast, on the brink of bankruptcy, was merged into Delta in May 1972.

2. Edward Altman was the first to apply quantitative techniques to traditional ratio analysis. See: Edward I. Altman, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy", *Journal of Finance*, XXIII (September 1968), 589-609. For an excellent discussion of other techniques, see: Baruch Lev, *Financial Statement Analysis*, Prentice-Hall Foundations of Finance Series, (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1974). This paper will utilize the work of Altman.

asures demonstrated to be consistent predictors in several studies of industrial bankruptcies.³ These five are:

- (1) the working capital to total assets ratio (WC/TA), a liquidity measure,
- (2) the retained earnings to total assets ratio (RE/TA), a measure of accumulated past profits relative to assets,
- (3) the earnings before interest and taxes to total assets ratio (EBIT/TA), a measure of the firm's basic earning power,
- (4) the market value of equity to book value of debt ratio (MVE/BVD), a measure of financial leverage,
- (5) the sales to total assets ratio (S/TA), often called capital turnover, a measure of the firm's productive use of assets.

Altman has combined these five, via an applied regression technique, into the following predictive model:⁴

$$Z = .012X_1 + .014X_2 + .033X_3 + .006X_4 + .999X_5$$

where $X_1 - X_5$ are the above financial ratios. The objective function, Z , is an index or score which Altman maintains is of considerable use in both forecasting insolvency several years in advance and in assessing overall financial performance. The critical values of Z are 1.81 and 2.67. A Z score of less than 1.81 indicates severe financial stress, a likely bankruptcy candidate, while a value in excess of 2.67 indicates a strong financial condition. Scores between these extremes form the gray area, firms out of immediate danger but not necessarily immune from problems in the future.⁵

Application to Air Transport

Exhibit I is an application of the Altman model to the ten domestic airlines for the years 1966 and 1973.⁶ On the exhibit, the first four ratios are expressed as percentage figures (that is, a ratio of 100/100 = 100.0% or 100.0). The last ratio is expressed as a decimal (100.0% = 1.00). The Z scores for both years are presented in the final column of Exhibit I and below in summary form:

3. *Ibid.*, Altman, 594, for a complete description of the ratios.

4. *Ibid.*, Altman's technique utilizes multiple discriminant analysis. As this paper emphasizes the use of the model, the reader interested in the derivation and testing of the model is referred to the original source for more detail. The actual application of the Altman model is quite simple, as demonstrated in Exhibit I.

5. Altman found that the Z value of 2.99 as the safest indicator of the strongest firms but that a cut off of 2.67 was the best dividing line.

6. The year 1966 was chosen as the base as it represented the height of the airlines' success despite a short strike noted below.

Z Values

	1966	1973
American	2.01	1.43
Eastern	2.16	1.10
TWA	2.30	1.54
United	2.34	1.67
Braniff	2.67	2.23
Continental	3.64	1.08
Delta	5.86	4.19
National	4.64	2.23
Northwest	6.50	2.31
Western	4.10	2.24

Two points are clear from the exhibit. First, there has been a sharp deterioration in the Z scores for all the ten carriers. Second, many now fall in Altman's critical zone.⁷

In 1966, the industry was at its zenith and the Z scores above reflect this situation.⁸ Five carriers (CAL, DAL, NAL, NW, and WAL) were well above the 2.67 barrier, and one (BRN) was on it. Only four (AAL, EAL, TWA, and UAL), the "Big Four", were in the middle range.⁹ No carrier was below the critical Z of 1.81. The model thus measures the majority of the carriers to be robust financially. The remainder are assessed as reasonably healthy. By 1973, however, the situation had changed dramatically. With Z scores falling significantly, five airlines (AAL, EAL, TWA, UAL, and CAL) are in the danger zone and only one (DAL) is well above 2.67. Four (BRN, NAL, NW, and WAL) are now in the middle area. The results therefore indicate an overall weakening in the industry's financial condition and the model now suggests that a significant probability of insolvency does exist for several of the carriers.

7. To insure that the Z values were not the product of random events, the author calculated values for 1965, 1967, and 1972 and found no significant differences between 1966 and the two years surrounding it or between 1972 and 1973. Z scores for 1972 were as follows: AAL (1.92), EAL (1.55), TWA (1.69), UAL (1.60), BRN (2.19), CAL (1.55), DAL (3.77), NAL (2.02), NW (3.45), and WAL (2.28).

8. Some ratios would have been slightly higher in 1966 had it not been for a strike in August which affected EAL, TWA, UAL, NAL, and NW. A mutual aid pact, however, did soften the strike's impact significantly.

9. These four carriers were under far more competitive pressures in 1966 than the other major carriers. As will be argued below, these pressures have had a lot to do with the financial problems of the airlines.

Exhibit I
Ratios and Z Values for the U.S. Domestic Airlines

		$X_1 = (WC/TA)$	$X_2 = (RE/TA)$	$X_3 = (EBIT/TA)$	$X_4 = (MVE/BVD)$	$X_5 = (S/TA)$	Z_i
<u>American:</u>	1966	13.73	18.63	8.74	104.3	.671	2.01
	1973	1.56	11.60	-2.20	50.2	.878	1.43
<u>Eastern:</u>	1966	4.37	9.87	4.38	154.3	.904	2.16
	1973	.50	1.36	-1.36	40.6	.879	1.10
<u>TWA:</u>	1966	1.99	14.80	7.82	166.7	.815	2.30
	1973	3.20	11.20	5.13	38.9	.943	1.54
<u>United:</u>	1966	18.89	9.46	5.92	179.6	.710	2.34
	1973	6.90	10.00	6.71	62.1	.852	1.67
<u>Braniff:</u>	1966	16.54	13.80	7.31	241.2	.570	2.67
	1973	3.66	16.01	9.01	125.4	.914	2.23
<u>Continental:</u>	1966	5.57	23.78	20.82	275.7	.899	3.64
	1973	-5.09	11.57	2.01	52.1	.599	1.08
<u>Delta:</u>	1966	13.78	29.80	25.16	565.2	1.058	5.86
	1973	-2.65	24.80	13.31	379.6	1.160	4.15
<u>National:</u>	1966	13.09	27.36	16.38	444.4	.894	4.64
	1973	2.91	24.61	8.54	141.5	.718	2.23
<u>Northwest:</u>	1966	3.78	34.92	23.36	745.2	.722	6.50
	1973	-1.57	35.30	4.72	189.3	.538	2.31
<u>Western:</u>	1966	9.89	30.88	18.40	341.4	.898	4.10
	1973	1.83	19.51	10.62	82.3	1.099	2.24

¹Z values are calculated from the Altman model. For example, for American: 1966 data

$$\begin{aligned}
 Z &= .08 \\
 Z &= .012X_1 + .014X_2 + .033X_3 + .006X_4 + .999X_5 \\
 Z &= .012(13.73) + .014(18.63) + .033(8.74) + .006(104.3) + .999(.671) \\
 Z &= 2.01
 \end{aligned}$$

Source: all ratios are computed using basic data from airline annual reports and from the *Value Line Investment Survey*.

Considering the results of the Altman model, is one led to predict the imminent insolvency of the industry? This author does not hypothesize the immediate demise of any of the ten for several reasons. First, it is very doubtful that the CAB would permit an actual bankruptcy. As in the Northeast case, the Board would likely opt for a merger instead. In addition, several of the carriers currently in trouble could recover should the economy and competitive conditions suddenly change for the better. This is true of American, United, and Continental.¹⁰ But the low Z scores, especially for EAL and TWA, (two carriers long plagued by financial woes), do indicate that the entire industry is under severe financial stress that all concerned cannot ignore. Should conditions disintegrate much more, a real possibility in mid-1974, bankruptcy may be the inevitable consequence for the latter two carriers. The travails of two of the largest domestic carriers (ranked third and fourth in asset size) would be of little comfort to an already troubled industry.

Given the deterioration in the Z values noted above, a corollary concern must be the reasons behind the decline. Although most of the five component ratios have declined for almost all the carriers, *two* of the five seem to hold the keys. They are the earning power ratio (X_3) and the leverage ratio (X_4).¹¹ The former ratio is heavily weighted in the model, and there can be no doubt that the lack of profitability in recent years is crucial to the industry's current state.¹² The ratios for CAL and NW are especially interesting: NW's EBIT/TA ratio decreased from 23.36% to 4.72%, and CAL's slid from 20.82% to only 2.01%. Ratios for EAL and AAL turned negative, while those of DAL, NAL, and WAL fell by approximately 50% or more. The prime factor eroding these ratios would appear to be competitive conditions within the industry. The fault largely lies with the CAB. In fostering excessive levels of competition between carriers, the Board has contributed to declining profit margins from two sides.¹³ Increased competition has diluted revenues and it has increased

10. American and United especially have only recently experienced severe problems. They are therefore a little better able than others to withstand further pressures.

11. These two ratios are the causal variables in the cause/effect chain. Declines in two other ratios (X_1 and X_2) are the effects. X_3 is also important, but overall turnover improved in the industry between 1966 and 1973, with the notable exceptions of DAL, NW, and NAL. It would be argued, however, that turnover ratios have been, and still are, historically low compared to other similar industries. This is the fault of the CAB's competitive emphasis discussed below.

12. Especially as the lack of profitability affects carrier liquidity (X_4 , the ratio of WC/TA).

13. The carriers themselves, however, are not totally blameless. They did eagerly increase capacity beyond reasonable bounds in the mid-1960s. Overscheduling on many route segments was still common up to the advent of the energy crisis in late 1973.

costs of operations.¹⁴

The other critical ratio, the leverage ratio (MVE/BVD), has declined sharply for *all* the carriers.¹⁵ The drop has been particularly pronounced for EAL, TWA, and CAL. Their ratios have fallen from 154.3% to 40.6%, from 166.7% to 38.9%, and from 275.7% to 52.1%, respectively. Causal to these declines are two factors. One is the airlines' heavy reliance on long-term debt finance. The other is the sharp break in airline stock prices over the last several years. The fault here lies with both the CAB and airline management. Insofar as the CAB contributed to sub-par profits via its competitive policies noted above, it thus also contributed to investor apathy toward airline common stocks. For its part, airline management shunned equity (stock) finance at a time when it was essential to the maintenance of sound financial structures. Instead, the carriers opted for the massive amounts of long-term debt that currently burden the industry.

Conclusions

This paper has demonstrated the rather fragile present financial condition of the U.S. Domestic airline industry. It has shown that a significant risk of insolvency does exist for several of the carriers should financial conditions deteriorate further. Regulatory and carrier actions must therefore be initiated before subsequent events give rise to another crisis of the magnitude of Penn-Central.

As the above analysis suggests that declining profitability and excessive debt finance are keys to the solvency problem, any actions taken to alleviate the current situation must act on both these areas of concern. Any significant decrease in debt burdens would take time, however, and thus immediate attention should be directed at short-term solutions geared to boosting profits directly. Few carriers have earned the "fair rate of return" (12.0%) set by the CAB in 1971.¹⁶ Considering the CAB's goal

14. The degree to which a carrier faces competition is an important determinant of cost levels. See: Gill, Frederick W., and Gilbert L. Bates, *Airline Competition*, (Boston, Mass.: Harvard University Press, 1949), 519. Excess competition results in duplicative advertising expenditures, "seat wars", etc.

15. This ratio is the most important of the five in the model for several reasons. First, because its absolute magnitude is by far the greatest, its contribution to the total Z value is the most significant, at least in this industry. Second, it is the growing debt burden that creates the real threat of insolvency. Interest charges on debt must be paid. Interest is a legal obligation arising out of a bond contract, and the failure to pay it will surely result in legal action by the bondholders. That legal action is the start of bankruptcy.

16. For data on rates of return, as defined by the CAB, see: Richard D. Gritta, "Risk and the 'Fair Rate of Return' in Air Transport", *Transportation Journal*, XIII (Summer

of fostering a "sound financial structure" in the industry, this situation must be corrected. Two possible avenues are open to accomplish this. The CAB might allow fare increases or it could act to reduce competition. As fare increases in the current economic environment might only serve to slow traffic growth, this author sees the latter alternative as the more viable.¹⁷ The CAB should therefore move quickly to reduce competition directly by cuts in new route awards and by permitting *constructive* mergers.¹⁸ Both actions would restore lost profitability to the carriers.

1974), 43. If rates of return are increased, stock prices would tend to rise, and the carriers would be in a better position to reduce their debt burdens via the sale of stock.

17. In fact, it could be argued that reduced competition would result in lower fares and increased traffic generation because of the cost savings that would result. See: Gill and Bates, *Airline Competition*.

18. The latter action would seem preferable as it would be more direct. But constructive mergers should be planned now before conditions worsen, and merger candidates should be selected with a view toward directly decreasing competition. The merger between DAL and Northeast in 1972, served only to intensify competition in the already overcompetitive NY-Florida market, injuring EAL further in the process. A merger between NAL and EAL would do much to restore the lost balance in this market. In addition, merger candidates should be matched properly. Mergers between weak carriers (such as those rumored between TWA and PanAm, and between TWA and EAL) would only serve to prolong the financial problems of the industry and would be self-defeating in the long-run. Stronger carriers should be paired with the weaker if a merger policy is to succeed.