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# BANKRUPTCY RISKS FACING THE MAJOR U.S. AIRLINES

RICHARD D. GRITTA\*

## INTRODUCTION

**F**OR THE LAST several years, Braniff Airways (Braniff) has faced increasing financial difficulties. On May 12, 1982, Braniff took the final step of suspending operations and filing a petition for reorganization,<sup>1</sup> thus becoming the first major United States air carrier to seek court protection from its creditors.

In the aftermath of Braniff's collapse, concerns of future air carrier insolvencies are increasing. With stock prices depressed and interest rates at near record levels, many air carriers are experiencing difficulties meeting growing demands for liquidity and for the financing necessary to purchase new aircraft. The financial structures of many air carriers are seriously overextended with debt. Given the potential catastrophic effects of such developments, a better method of gauging the financial health of air carriers and the likelihood of insolvency in air transportation is needed to protect investors and creditors.

Financial analysts have long searched for accurate methods of predicting business failure. Recent research attempts involve the use of predictive models which combine traditional financial analysis with statistical analysis.<sup>2</sup> This article will

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<sup>1</sup> *Braniff Files for Reorganization*, AV. WEEK & SPACE TECH., May 17, 1982, at 29. Braniff filed a petition under the Bankruptcy Code, 11 U.S.C. § 301 (Supp. IV 1980). If granted, this would allow Braniff to reorganize and resume operations under the protection of a federal court.

<sup>2</sup> See B. LEV, *FINANCIAL STATEMENT ANALYSIS: A NEW APPROACH* (1974); Altman, *Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bank-*

apply a generally accepted model to air transportation in an effort to appraise air carriers' financial strength and to predict likely bankruptcy candidates. This analysis will aid in pinpointing the causes of the air carriers' financial difficulties and should be of interest to airline management, creditors, and regulators.

As background for this article, a brief treatment of the financial patterns of the air carrier industry will be presented to provide a basic understanding of the impact of air carrier financing on solvency. The predictive model will be presented, explained, and applied to the major carriers or trunklines, as defined by the Civil Aeronautics Board (CAB).<sup>3</sup> The remaining analysis will examine the results and explore the implications for the future of the air carrier industry.

### I. AIRLINE FINANCING, 1960-1981

The economy, high interest rates, rising fuel costs, and farewars have all interacted to seriously impair the profitability of the air carriers and to force many close to insolvency.<sup>4</sup> No attempt is made here to minimize the collective impact of these factors and they do influence the variables in the model to be presented, but the crisis in the industry has not arrived overnight, as some believe. These factors may be the immediate causes of the industry's problems—"the straws that broke the camel's back"—but, in reality, the root or primal cause of the problems facing the industry has been the financial strategies followed by many of the carriers over the past two decades.

To secure financing for the acquisition of assets, air carrier

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*ruptcy*, 23 J. FIN. 589 (1968). See *infra* notes 18-36 and accompanying text.

<sup>3</sup> Section 416(a) of the Federal Aviation Act empowers the CAB to establish "classifications or groups of air carriers." 49 U.S.C. § 1386(a) (1976). Pursuant to this section, the CAB has classified the following carriers, which are the subject of this study, as trunklines: American Airways, Braniff Airways, Continental Airways, Delta Air Lines, Eastern Airlines, Northwest Airlines, Trans World Airlines, United Airlines, and Western Airlines. See W. O'CONNOR, AN INTRODUCTION TO AIRLINE ECONOMICS 11-12 (2d ed. 1982).

<sup>4</sup> To this list, some would add the deregulation of the industry introduced by the Airline Deregulation Act of 1978, Pub. L. No. 95-504, 92 Stat. 1705 (1978) (codified as amended at 49 U.S.C. §§ 1302 (Supp IV 1980)). This author, however, would not include this factor for reasons that will come evident later in the paper.

management has basically only two choices. Management may finance with debt or with equity (stock or retained earnings).<sup>5</sup> Debt financing entails risk while equity financing is conservative. The airlines have traditionally, with some exceptions, chosen the former method of finance. Whether this strategy has been wise is now open to question.

The decision to choose debt or equity is complicated, but some guidelines are generally accepted.<sup>6</sup> The airline industry has always been highly leveraged in the operating sense, because air carriers face significant fixed operating costs that are inherent in the nature of the industry.<sup>7</sup> These costs do not vary as output or revenues change; therefore, operating profits, often called earnings before interest and taxes (EBIT), and operating rates of return on assets (EBIT/Total Assets) will be more unstable than in industries characterized by lower fixed costs.<sup>8</sup> The traditional vulnerability of the air transportation industry to recessions further increases this instability. An industry facing such conditions should therefore follow more conservative financial strategies.<sup>9</sup> The use of debt finance, or financial leverage, is risky because a fixed charge

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<sup>5</sup> Many carriers have chosen leasing as arguably a third alternative. However, the traditional aircraft lease is a financial lease in nature and therefore is the equivalent of long-term debt finance. They are treated as such for the purposes of this study. See Gritta, *Capitalizing Net Lease-Rentals: A Comment*, MGMT. ACCT., Nov. 1974, at 37-39.

<sup>6</sup> The only purpose of this section is to briefly summarize the carriers' financial patterns. For a more complete treatment of optimal financing, See J. WESTON & E. BRIGHAM, *MANAGERIAL FINANCE* 550-86, (7th ed. 1981); Taggart, *A Model of Corporate Financing Decisions*, 34 J. FIN. 931 (1979).

<sup>7</sup> All enterprises experience two types of leverage: operating and financial. Operating leverage results from high fixed costs (such as the purchase of airplanes); financial leverage largely results from high interest costs. J. WESTON & E. BRIGHAM, *supra* note 6, at 550-74. See J. FREDERICK, *COMMERCIAL AIR TRANSPORTATION* 331-334 (5th ed. 1961).

<sup>8</sup> See, e.g., Pakkala, *Fixed Costs Impact Earnings Prediction*, FIN. ANALYSTS J., (Jan.-Feb., 1979), at 46. For the theory behind cost structure, and the effect of fixed costs, see J. WESTON & E. BRIGHAM, *supra* note 6, at 571-74. For the resulting instability in the airline industry, see Gritta, *The Effect of Financial Leverage on Air Carrier Earnings-A Break-Even Analysis*, FIN. MGMT., Summer 1979, at 53.

<sup>9</sup> This is, of course, a basic principle of finance discussed in most finance texts. See, e.g., ARCHER, G. CHOATE, G. RACETTE, *FINANCIAL MANAGEMENT* 227-56 (1979), J. VAN HORNE, *FINANCIAL MANAGEMENT AND POLICY* 261-92 (9th ed. 1980); J. WESTON & E. BRIGHAM, *supra* note 6, at 550-86.

(interest) increases and acts to further heighten the variability of net profits and the return on equity ( $r_e$ ). This is because the return on equity is linked to the return on assets ( $r_o$ ) through a debt/equity ratio ( $D/E$ ).<sup>10</sup> A simple formula will help demonstrate this concept:

$$r_e = r_o + (r_o - i)D/E \quad ^{11}$$

The interest rate on debt is  $i$ . This formula simply states that the return on equity is equal to the return on assets plus a factor of the differential between the return on assets and the cost to finance those assets times the debt/equity ratio.

The danger involved with debt finance may be seen from the equation. An example will help illustrate this point. Assume the existence of three hypothetical air carriers: A, B, and C. Carrier A employs a conservative financial strategy; using no debt finance.<sup>12</sup> C, on the other hand, follows a liberal strategy and employs three dollars of debt for every one dollar of equity it raises (either internally or externally). Carrier B pur-

<sup>10</sup> The debt-to-equity ratio is simply the ratio of total debt (current liabilities and long-term debt) to equity or net worth (all the common stock accounts and retained earnings). J. WESTON & E. BRIGHAM, *supra* note 6, at 140-41.

<sup>11</sup> See *id.* at 107, 552. This formula is developed from a typical income statement. Assume a firm has \$1.0 million in assets, financed half by equity and half by debt (with an interest rate of 8%). Assume also that the firm earns a pre-tax return on assets of 20%. Its EBIT level will therefore be \$200,000 or 20% of the \$1.0 million. If the tax rate is 50%, for simplicity, the income statement will look like this:

EBIT	\$200.0
- i (at 8%)	40.0
Profit Before Taxes	160.0
- Taxes	80.0
Net Profit	\$80.0

The rate of return on net worth (which is \$500,000) is therefore equal to \$80.0/\$500.0 or 16.0%. This can be found directly via a formula:

$$r_e = [r_o + (r_o - i) D/E ] (1 - t)$$

$$r_e = [20\% + (20\% - 8\%) 500/500 ] (1 - .50)$$

$$r_e = 16\%$$

Many airlines currently are losing money and their effective tax rate ( $t$ ) is 0%, and therefore the formula can be reduced for purposes of illustration to that in the text.

<sup>12</sup> Of course, some debt finance would always be necessary, for all firms have at least some short-term debt (i.e. current liabilities).

sues a middle course and employs one dollar of debt for every dollar of equity. Assume also that all the carriers have the same operating profitability ( $r_o$  or EBIT/TA) of 20% and that all have an interest rate cost of 10%.<sup>13</sup> A, B, and C's returns on equity will be as follows:

$$A: r_e = 20\% + (20\% - 10\%)0 = 20\%$$

$$B: r_e = 20\% + (20\% - 10\%)1 = 30\%$$

$$C: r_e = 20\% + (20\% - 10\%)3 = 50\%$$

Because the return on assets exceeds the interest rate, clearly carrier C will report the greatest profitability. However, C pays a high price for this potential. Air carriers face unstable operating profit levels; accordingly, if  $r_o$  decreases from 20% to 19%, carrier A's  $r_e$  will decrease by only 1%, the same percentage decline as its operating return has declined. Carrier B's  $r_e$ , however, will fall by 2% (to 28%), and C's by 4% (to 46%). Thus, as the D/E ratio increases, the variability given a 1% change in  $r_o$  increases. Furthermore, should either  $r_o$  decline below  $i$  or  $i$  increase above  $r_o$ , as both have in recent years, leverage will become negative, and as the equation suggests, rates of return on equity will be higher and less volatile in the case of carrier A.<sup>14</sup>

Debt finance, therefore, presents opportunities for higher rates of return, but it also increases risk, especially in the face of volatile operating profits. The ultimate risk is, of course, that should operating returns decrease sufficiently or should interest rates increase sharply, an air carrier may not be able to pay interest charges and therefore may become insolvent. The debt/equity ratio thus becomes an important measure of financial risk and a gauge of bankruptcy probabilities.

Chart I, which presents actual debt/equity ratios for the air

<sup>13</sup> In reality, interest rates would increase as the D/E ratio increases. Because of increased risks, lenders would demand higher returns on their money. For simplicity, a constant interest rate is assumed here.

<sup>14</sup> If  $r_o$  fell to 10% and interest rates increased to 15%, for example, carrier A's  $r_e$  would fall to 10%, but B's and C's rates of return on equity would fall to 5% and -5%, respectively. Because the factor ( $r_o - i$ ) is now negative, the impact of the leverage is unfavorable.

carriers for the period 1960 to 1981, illustrates the tremendous risk facing the air carrier industry. Note especially the 1981 ratios for Braniff (8.22), Continental (5.12), Eastern (4.50), TWA (3.91), and Western (3.92). These air carriers continually employed debt to finance expansion over the past twenty years, as their increasing debt/equity ratios indicate. During this period, Braniff became particularly overleveraged; its debt/equity ratio increased from 1.54, the second lowest ratio in 1960, to 8.22, the highest of the group in 1981.<sup>16</sup> At the time of this analysis, Braniff had total debt of \$887.5 million with an asset base of only \$995.7 million, while its total interest charges reached \$60.5 million.<sup>16</sup> The conservative strategies followed by both Northwest and Delta are also interesting. Their debt ratios were 0.87 and 1.25, respectively. Delta, in particular, has chosen to finance rather conservatively.<sup>17</sup>

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<sup>16</sup> One might wonder why lenders kept financing a carrier losing money like Braniff. Most long-term airline debt is held by large financial institutions and collateralized by aircraft, and with the unfavorable market in used jets, these financial institutions were reluctant to move to force payment on debt. Many bankers probably felt that the CAB would never permit a bankruptcy to occur, and, moreover, the air carriers needed further funds to continue operations, so the institutions, hoping that conditions in the future would improve favorably, simply kept advancing money to Braniff and other similarly affected air carriers.

<sup>16</sup> The data from Braniff's income statement and balance sheet was reprinted in: C.A.B., AIR CARRIER FINANCIAL STATISTICS, (Sept. 1981).

<sup>17</sup> These two carriers' higher profits, resulting from strong cost controls and favorable route structures, undoubtedly allowed them to finance more conservatively. They could rely upon internally generated equity and, therefore, did not need to resort to debt finance. Cash flows were sufficient to meet most demands for funds. See Rothmeier, *The Effects of Financial Leverage on Air Carrier Earnings: A Break Even Analysis*, Comment, FIN. MGMT., Spring 1980, at 88-89.

## CHART I

## Debt/Equity Ratios for the U.S. Domestic Airlines\*

	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1975</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
<u>American:</u>	2.35	2.54	3.27	1.99	2.34	2.56	3.06	3.27
<u>Braniff:</u>	1.54	1.45	3.61	2.21	2.11	2.93	4.51	8.22
<u>Continental:</u>	3.50	1.79	4.13	3.80	1.92	2.45	3.04	5.12
<u>Delta:</u>	2.55	1.40	1.73	1.92	1.01	1.18	1.20	1.25
<u>Eastern:</u>	2.12	2.74	4.01	3.57	3.46	4.20	4.05	4.50
<u>Northwest:</u>	1.92	1.07	1.01	0.97	0.78	0.84	0.87	0.87
<u>TWA:</u>	2.60	2.06	3.86	4.31	2.93	3.42	3.85	3.91
<u>United:</u>	2.28	2.42	2.98	2.63	2.09	2.56	2.74	2.83
<u>Western:</u>	1.18	1.30	3.51	2.12	2.54	2.52	3.65	3.92

\* Debt/Equity ratio is the ratio of total debt (current liabilities and non-current liabilities) to equity or net worth (common stock, preferred stock, and retained earnings). Ratios from 1978 on reflect the impact of the capitalization of lease obligations.

SOURCE: Ratios are calculated from balance sheet data contained in the CAB's *Air Carrier Financial Statistics*; various issues.



**CHART II**  
**Rates of Return on Common Equity**  
**U.S. Domestic Airlines**  
**1972-1981**

	Range		<u>Average*</u>	<u>Standard Deviation**</u>
	<u>High</u>	<u>Low</u>		
<u>American:</u>	16.2%	-15.6%	2.4%	9.7%
<u>Braniff:</u>	18.1%	-126.6%	-4.2%	47.6%
<u>Continental:</u>	21.5%	-80.2%	-4.7%	28.3%
<u>Delta:</u>	20.4%	10.1%	14.8%	3.4%
<u>Eastern:</u>	15.3%	-20.0%	-0.5%	13.3%
<u>Northwest:</u>	12.8%	0.8%	7.1%	3.8%
<u>TWA:</u>	16.1%	-25.7%	4.0%	12.2%
<u>United:</u>	25.6%	-6.3%	5.4%	9.1%
<u>Western:</u>	19.4%	-52.3%	4.4%	22.4%

\* The arithmetic mean or average for the years, 1972-1981.

\*\* The standard deviation around the arithmetic mean.

SOURCE: Calculated from raw data contained in the *Value Line Investment Survey*, January 8, 1982 at 256-277.

Chart II illustrates the impact of the carriers' financial policies on their returns on equity. As expected, the highly leveraged air carriers, Braniff, Continental, Eastern, TWA, and Western, have wide swings in their rates of profit as measured by the large ranges and high standard deviations of their returns. Braniff's rate of return on equity, for example, ranged from -126% (in 1981) to 18.1%, and its standard deviation was an incredible 47.6%, while Continental's and Western's ranges and standard deviations were also significant (-80.2% to 21.5% with a standard deviation of 28.3% for Continental and -52.3% to 19.4% with a deviation of 22.4% for Western). Contrast these figures to those of Delta and Northwest and the volatility penalty paid for using excessive levels of debt is obvious.

The negative or low average rates of return for those carriers high in debt is also significant. Braniff's and Continental's rates of return averaged -4.2% and -4.7%, respectively, as opposed to Delta's 14.8% and Northwest's 7.1%. Although the rate of return on equity does not appear in the model to follow, it will become clear in the next section of the paper that this poor profitability has affected both the liquidity and staying power of these airlines, as evidenced by several key inputs into the model. With the background provided in this section, the model now will be introduced.

## II. THE ALTMAN MODEL

Financial analysts have traditionally measured financial strength by key ratios that gauge liquidity (the ability to pay obligations as they come due), leverage (the use of debt finance), turnover (the efficiency of asset use), and profitability, in an effort to predict future financial developments.<sup>18</sup> Little empirical evidence, however, had actually linked these ratios to the successful prediction of corporate failure. Early research by W. Beaver in the mid-1960's attempted to statistically correlate ratios to subsequent failure using single varia-

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<sup>18</sup> See Horrigan, *A Short History of Financial Ratio Analysis*, 43 *Acct. R.* 284 (1968).

ble models.<sup>19</sup> His attempts were a major improvement on the existing analysis. Edward Altman further improved on these models by combining groups of ratios into a multivariate model using five variables with greater predictive powers. The use of this model and its application to the aviation industry is the subject of this article.<sup>20</sup> Altman based his original research upon a sample of 66 Dun & Bradstreet manufacturing firms with asset sizes up to \$25 million, half of which had become insolvent in the period up to 1965.<sup>21</sup> He later extended and statistically validated the model on much larger firms, in different industries, and for different time horizons.<sup>22</sup>

Altman's model has not been without critics. R.C. Moyer has argued that the predictive ability of Altman's model is lower when applied to time horizons different from Altman's original study and for firms of different asset size.<sup>23</sup> Moyer also suggested that a simpler model with fewer variables may perform as well as Altman's original five variable model.<sup>24</sup> Other analysts have criticized Altman's statistical technique of testing his model using hold-out samples from the original time horizon, as opposed to validating the model on a sample

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<sup>19</sup> See Beaver, *Financial Ratios as Predictors of Failure*, J. ACCT. RESEARCH 71 (1966).

<sup>20</sup> See Altman, *supra* note 2, for the original proposal of Altman's model in 1968. For Altman's subsequent work on this subject, see ALTMAN, CORPORATE BANKRUPTCY IN AMERICA (1971); Altman, *Predicting Railroad Bankruptcies in America*, BELL J. OF ECON. & MGMT. SCI., Spring 1973, at 184; Altman, Haldeman & Narayanan, *Zeta Analysis: A New Model to Identify Bankruptcy Risk of Corporations*, 1 J. OF BANKING & FIN., June 1977, at 29; Altman & McGough, *Evaluation of a Company as a Going Concern*, J. OF ACCT., Dec. 1974, at 50.

<sup>21</sup> Altman, *supra* note 2, at 593.

<sup>22</sup> See, e.g., Altman, *Predicting Railroad Bankruptcies in America*, BELL J. OF ECON. & MGMT. SCI., Spring 1973, at 184-211; Altman & Lafleur, *Managing a Return to Financial Health*, J. OF BUS. STRATEGY, Summer 1981, at 47; Altman & McGough, *Evaluation of a Company as a Going Concern*, J. OF ACCT., Dec. 1974, at 50.

<sup>23</sup> See Moyer, *Forecasting Financial Failure: A Re-Examination*, FIN. MGMT., Spring 1977 at 11.

<sup>24</sup> *Id.* at 12. Using data on 54 firms (half of which failed) with asset sizes up to \$1 billion, and updating the time horizon to the 1965-1975 period, Moyer maintained that Altman's overall success rate of prediction falls from 95% found by Altman one year prior to bankruptcy, to only 75%. He achieves an overall success rate of 90.5% with a "naive" model, which deletes two of Altman's variables. *Id.* Moyer did find, however, that Altman's model had a very low error rate of classifying non-failing firms as failing, *id.* at 16, which is, of course, the greater concern of this article.

after the study period.<sup>25</sup>

Altman has countered the criticisms of his model and defended its application. In answer to the criticism that the model needed to be updated beyond the original testing period, Altman applied the model to larger firms for the period of 1970-73 and achieved an 82% overall success rate.<sup>26</sup> In addition, Altman retested his model on Moyer's 1965-75 sample of manufacturing, retailing and service firms and found an overall success rate of over 82% in predicting bankruptcies, thereby rebutting Moyer's criticism that a simpler model achieves results equal to Altman's more complex model.<sup>27</sup> In response to the criticism of his statistical methods, Altman has argued that using new data from the same sample period does provide a valid test of the model and its individual component measures and parameters and does not limit the usefulness of the model in predicting insolvency.<sup>28</sup> In sum, Altman's model with its subsequent updating and testing remains the most widely used model in predicting corporate bankruptcy.<sup>29</sup>

Altman's model isolated five important ratios demonstrated to be consistent predictors in several studies of corporate bankruptcy.<sup>30</sup> These five ratios are:

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<sup>25</sup> See Joy & Tollefson, *On the Financial Applications of Discriminate Analysis*, 10 J. OF FIN. & QUANTATIVE ANALYSIS 723 (1975). Joy and Tollefson maintained that Altman should have employed a non-linear (quadratic) form of his multiple discriminant model, as well as the linear form he used. *Id.* at 773-75. See *infra* note 36.

<sup>26</sup> Altman & McGough, *Evaluation of a Company as a Going Concern*, J. OF ACCT. DEC. 1974, at 50.

<sup>27</sup> Altman, *Examining Moyer's Re-examination of Forecasting Financial Failure*, FIN. MGMT., Winter 1978 at 76. This sample included the Penn-Central and Leigh Valley railroads. *Id.* at 78.

<sup>28</sup> Altman & Eisenbeis, *Financial Applications of Discriminant Analysis: A Clarification*, 13 J. OF QUANTITATIVE & FIN. ANALYSIS 185 (1978). Altman has also answered the question concerning the appropriateness of a linear, versus a quadratic, model. See *supra* note 25. Altman found no difference in the predictive ability of either form of multiple discriminate analysis. See Altman, *A Financial Early Warning System for Over-the-Counter Broker-dealers*, 31 J. OF FIN. 1201 (1976).

<sup>29</sup> See, e.g., E. SOLOMON & J. PRINGLE, AN INTRODUCTION TO FINANCIAL MANAGEMENT 122 (2d ed. 1980); J. Van Horne, *Financial Management and Policy* 691-4 (5th ed. 1980), J. WESTON & E. BRIGHAM, *supra* note 6, at 192-94; Altman & LaFleur, *Managing a Return to Financial Health*, J. OF BUS. STRATEGY, Summer 1981, at 47.

<sup>30</sup> See, Altman, *supra* note 2, at 594.

1. The working capital to total asset ratio (WC/TA), which is a liquidity measure. Working capital is defined as current assets less current liabilities. Altman argues that the higher this ratio, and therefore the more liquid the firm, the lower the probability of insolvency.<sup>31</sup>
2. The retained earnings to total asset ratio (RE/TA) is a measure of accumulated past profits to assets. As a measure of "staying power," when this ratio is high bankruptcy is less likely to occur.<sup>32</sup>
3. The ratio of earnings before interest and taxes to total assets (EBIT/TA) is a measure of a firm's basic return on assets. High ratios indicate decreased risk.<sup>33</sup>
4. The market value of equity to book value of debt ratio (MVE/BVD) is a gauge of financial leverage. This ratio is an inverted variation of the debt/equity ratio discussed in the previous section. Lower ratios decrease insolvency risk.<sup>34</sup>
5. The sales to total asset ratio (S/TA), often called the capital turnover ratio, which is a measure of a firm's productive use of assets. High ratios are favorable.<sup>35</sup>

Altman combined these five ratios through an applied regression technique known as multiple discriminant analysis,<sup>36</sup>

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<sup>31</sup> *Id.*

<sup>32</sup> *Id.* at 595.

<sup>33</sup> *Id.*

<sup>34</sup> *Id.* Not only is Altman's ratio inverted, but it employs the market value of equity (the price times the number of shares) instead of book values or balance sheet values to a company. While this ratio differs from the traditional ratio used by bankers and financial analysts, *see supra* note 10 and accompanying text, it measures the same variable, financial leverage. Altman found his version better fit the model. *See id.* at 594.

<sup>35</sup>*Id.* at 596.

<sup>36</sup> Multiple discriminant analysis (MDA) is a statistical technique involving the correlation statistically of key variables (called independent variables) with a variable to be predicted (the dependent variable). *See id.* at 590-93. The dependent variable is an index that allows classification of an observation into one of several *a priori* groupings in this case, failed versus successful firms. The MDA technique derives a linear combination of the characteristics that best discriminate between the groups (that is, those discriminations that minimize the probability of misclassifications). Altman applied twenty-two financial ratios, five of which were found to contribute most to the predictive model. The slope terms (e.g. .012) are the result of Altman's evaluation of the relative statistical significance and intercorrelation of the variables. *Id.* at 594.

into the following predictive model:<sup>37</sup>

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

where  $X_1$ - $X_5$  are the above five ratios. The objective function, or Z score, is an index which Altman maintains is of considerable use in both forecasting bankruptcy several years in advance and in assessing overall financial performance. The critical values of Z are 1.81 and 2.99. A Z score of less than 1.81 indicates severe financial stress, a likely bankruptcy, while a value of 2.99 or more signals a stronger financial position.<sup>38</sup> Scores between these two extremes form the gray area, or "zone of ignorance," where classification is more difficult.<sup>39</sup>

Chart III applies the Altman Model to the trunklines for the years 1978, a year of increasing profits, and 1981, a year of financial difficulties. The first four ratios are expressed as percentiles so that a ratio of 50/100 is input as 50.0%, a ratio of 100/100, as 100.0%, etc. The final ratio is input as a decimal. Thus, 100/100 becomes 1.00. The Z scores are presented in the final column on Chart III and below in summary form:

	<u>1981</u>	<u>1978</u>
American	2.00	2.16
Braniff	0.90	2.35
Continental	1.57	2.05
Delta	3.54	4.18
Eastern	2.19	2.21
Northwest	2.85	3.14
TWA	1.86	2.19
United	2.09	2.57
Western	1.68	2.43

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<sup>37</sup> *Id.*

<sup>38</sup> *Id.* at 606.

<sup>39</sup> Not one firm with a Z score of 1.81 or less survived, while no firm with a Z score of 2.99 or more failed. The "zone of ignorance" included both types. *Id.*

CHART III  
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*
<u>American:</u>	1981	2.2%	13.8%	3.6%	46.9%	1.37	2.00
	1978	12.6	15.6	8.9	62.4	1.13	2.16
<u>Braniff:</u>	1981	-11.1	-8.3	-9.9	15.2	1.38	0.90
	1978	-1.5	23.6	11.8	78.5	1.18	2.35
<u>Continental:</u>	1981	-4.1	7.5	-2.0	34.8	1.37	1.57
	1978	-9.9	21.4	11.1	62.4	1.13	2.05
<u>Delta:</u>	1981	-4.5	38.5	9.3	201.8	1.54	3.54
	1978	-2.5	41.2	16.0	281.8	1.41	4.18
<u>Eastern:</u>	1981	-0.4	2.0	4.6	34.1	1.81	2.19
	1978	-9.7	2.0	10.6	47.5	1.66	2.21
<u>Northwest:</u>	1981	-7.4	43.8	2.1	182.6	1.16	2.85
	1978**	8.6	44.5	14.8	182.4	0.82	3.14
<u>TWA:</u>	1981	-6.0	8.9	4.2	32.3	1.47	1.86
	1978	-1.9	12.1	8.4	51.4	1.46	2.19
<u>United:</u>	1981	-11.7	9.7	0.4	57.6	1.73	2.09
	1978	10.1	18.1	13.6	86.0	1.23	2.57
<u>Western:</u>	1981	-9.1	13.6	-0.1	31.3	1.41	1.68
	1978	1.3	21.2	11.4	59.7	1.38	2.43

\* Z values are calculated from the Altman Model. Using 1981 data for Delta, for example:

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

$$Z = .012(-4.5) + .014(38.5) + .033(9.3) + .006(201.8) + .999(1.54)$$

$$Z = 3.54$$

\*\* 1978 results for Northwest were influenced by a strike which partially interrupted operations from 4/29/78 to 8/14/78.

SOURCE: All ratios were computed using basic income statement and balance sheet data contained in the CAB's Air Carrier Financial Statistics, December 1978 and September 1981 editions. 1981 figures are for the twelve-month period ended September 30, 1981. Market value data is from the Value Line Investment Survey, various issues.

Two facts are clear. First, there has been a sharp deterioration in all the air carriers' Z scores. Second, three air carriers now fall below the critical Z score of 1.81.

In 1978, the industry's profitability was increasing and the Z scores reflected this situation. Although only Delta (4.18) and Northwest (3.14) had Z scores substantially above the 2.99 zone, all of the remaining air carriers were above the 1.81 cutoff. By 1981, however, the situation had changed dramatically. The model has successfully predicted the bankruptcy of Braniff for the air carrier has the lowest Z score in the sampling (0.090). The model also predicts trouble for both Continental and Western. Several other air carriers have fallen perilously close to the danger point. TWA, for example, has a Z score of only 1.86.

Given the deterioration of the Z scores, the causes of the decline need to be considered. Altman found variables  $X_3$  (the return on assets) and  $X_4$  (the leverage measure) to be two of the most statistically significant variables in predicting bankruptcy.<sup>40</sup>

The return on assets variable ( $X_3$ ) is heavily weighted in the model, and few would doubt that the lack of profitability is the immediate cause of the industry's problems. In particular, the plight of Braniff, Continental, and Western is evidenced by the fact that their returns on assets turned negative in 1981. Braniff's return fell from 11.8% (in 1978) to -9.9%, Continental's declined from 11.1% to -2.0%, and Western's slid from 11.4% to -0.1%. Certainly, rising fuel costs hurt these air carriers, as did the growing proliferation of discount fares. In 1981, the cost of a gallon of fuel rose to an average of \$1.02, up 16.7% over the prior year and up an incredible 726.5% over the 1973 price.<sup>41</sup> This increase damaged the operating cost structures of the air carriers. Reve-

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<sup>40</sup> The importance of these two ratios to the air carrier industry was discussed supra at note 10 and accompanying text. Altman found the three most statistically significant variables to be  $X_3$ ,  $X_4$ , and  $X_5$ . *Id.* at 597. The latter variable was ranked first in the combined model, but it does not appear to be as important in air transportation, despite its weight and absolute size. In general, capital turnover in this industry has been fairly good historically and it has increased since 1978.

<sup>41</sup> C.A.B., FINANCIAL SECTION, FUEL COST AND CONSUMPTION (Sept. 1981).



nues were diluted by discounting and the percentage of revenue passenger miles flown by all air carriers on discount fares rose from 51% in 1978 to over 76% in late 1981.<sup>42</sup> Indeed these were several of the "straws" alluded to earlier.<sup>43</sup> But rising fuel costs and interest rates, and fare wars, affected all the carriers relatively equally, and, as noted above, the volatility in the return on assets is intrinsic in the industry because of its fixed operating cost structure.<sup>44</sup> In a recession, returns will decline. This was true before the tremendous surge in fuel costs and fare wars.<sup>45</sup> The true long-term cause of the problem therefore lies elsewhere; arguably in the leverage variable.

The debt ratio ( $X_4$ ) remains far more critical, not only because of its weight in the model and its absolute size, but, more importantly, because of the effects of the debt ratio on volatile returns on assets noted in the prior section of this paper.<sup>46</sup> In terms of the model, Braniff's ratio decreased sharply from 78.5% to 15.2%, and Continental's and Western's fell by nearly 50% (from 62.4% to 34.8% and from 59.7% to 31.3%, respectively). Contrast these figures to the debt ratios of Delta (201.8%) and Northwest (182.6%). With interest rates increasing, the debt burdens of most of the air carriers have created the tremendous drain on the air carriers net profitability noted on Chart II.<sup>47</sup> This in turn is directly responsible for the

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<sup>42</sup> *Air Transportation Industry Analysis, XXXVII VALUE LINE INVESTMENT SURVEY* 251 (Jan. 8, 1982) [hereinafter cited as *Investment Survey*].

<sup>43</sup> Certainly, Braniff's strategy after deregulation to expand radically its market position by going after dozens of new routes did hurt that carrier as the -9.9% return indicates, especially as it slashed fares to gain entry into these markets. See *Storm Warnings*, Wall St. J., May 14, 1982, at 1, col. 6.

<sup>44</sup> See *supra* note 7 and accompanying text.

<sup>45</sup> Again, no attempt is made to downplay these factors. They are important to the crisis, but their impact would have been far less severe had the carriers been more conservative in their financing.

<sup>46</sup> See *supra* note 10 and accompanying text. For Delta and Northwest, the weight of the debt ratio in the model is very important because of the size of the leverage variable. Even though the coefficient of the leverage variable is only .006, for these carriers the leverage variable is large. For Delta, for example, .006 times 200.0%, ( $X_4$  in 1981) adds 1.2 to the Z score. The contribution of  $X_3$ , the return on assets, is much smaller though its coefficient is larger (.033 times 9.3%-see Chart III is only .40, the contribution of this variable to the Z score).

<sup>47</sup> In many cases, carriers floated long-term bond issues when the immediate effect was to put them in an area of negative financial leverage. See *supra* note 8.

deterioration in variables  $X_1$ , the liquidity ratio, and  $X_2$ , the ratio of past profits or retained earnings to assets. For most of the air carriers,  $X_2$  declined under the influence of unfavorable leverage. Braniff's ratio actually turned negative in 1981 (-8.3%), while Continental's and Western's also dropped sharply from 21.4% to 7.5% and 21.1% to 13.6%. Again, the contrast to Delta and Northwest is striking. Their ratios stood 38.5% and 43.8%, down only very slightly from 1978.

At this point, some might still be tempted to blame Braniff's problems on its over-expansion and argue that if the economy had been better, Braniff would have survived. In the Altman model a poor leverage variable can be offset by strong operating profitability ( $X_3$ ) and high turnover ( $X_5$ ). However, it is unlikely that this would have alleviated Braniff's problems. Because of Braniff's over-expansion, variables like  $X_3$  fell sharply, but it was still the leverage variable ( $X_4$ ) that took Braniff's depressed operating profits and magnified the losses greatly, thus leading to the insolvency.

Had the majority of the air carriers not employed such a high degree of financial leverage, the situation would not have reached crisis proportions. An air carrier with little debt may operate unprofitably for a longer period of time than a similarly situated but overleveraged air carrier. As the cases of Delta and Northwest suggest, lower debt ratios have actually been synonymous with higher and more stable net profits.<sup>48</sup> The warning against excessive debt finance in any industry suffering from volatile returns on assets is therefore very painfully evident in the present state of the air transportation industry.<sup>49</sup>

Some would lay blame for the industry's crisis on the der-

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<sup>48</sup> Financial theory would suggest the opposite. Risk and returns should be positively, not negatively, correlated. Greater risk exposure should be compensated for by higher rates of return. Otherwise an enterprise will experience difficulties raising new equity through the sale of stock. See J. WESTON & BRIGHAM, *supra* note 6, at 278-80.

<sup>49</sup> In fact, most industries do attempt to balance risks. Industries that have unstable operating profits, normally use lower levels of debt finance. They do conform to the sound "principle of finance" alluded to previously. For a study that contrasts the airlines to several other regulated groups and to a sample of industrial firms, see Gritta, *An Unresolved Issue in Setting the Cost of Capital to the U.S. Domestic Airlines*, 41 J. AIR L. & COM. 67,70 (1975).

egulation of air carriers in 1978. This analysis, however, does not appear valid. As the model illustrates, air carriers have actually become more efficient since 1978, as evidenced by their capital turnover ratios,  $X_5$ . As noted previously, the sales total asset ratio ( $X_5$ ) is an important measure of how effectively management is employing its assets.<sup>50</sup> High ratios indicated greater efficiency or productivity. Without exception, all the air carriers increased their efficiency as measured by this ratio.<sup>51</sup> While deregulation did permit air carriers greater flexibility and freedom in pricing, expansion, etc., it did not cause air carrier management to make mistakes.<sup>52</sup> Deregulation merely substituted the market mechanism for government decision making. Deregulation did not force carriers like Braniff to over-expand. Deregulation, on the whole, has prodded air carrier management to be more efficient and competitive.<sup>53</sup>

### III. CONCLUSION

This article has briefly summarized the financial patterns of the major United States air carriers and applied, to the industry, a model which both measures overall financial health and the danger of insolvency. The majority of the air carriers were found to be financially weak. The model successfully predicted the bankruptcy of Braniff.

The causes of the situation were also explored, and the impact of debt financing over time was argued to be the critical long-term factor behind the problem, as it exaggerated the impact of the more pressing short-term problems such as fuel cost increases, the recession, and farewars.

Considering the results of the Altman Model, one may

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<sup>50</sup> See *supra* note 35 and accompanying text.

<sup>51</sup> It is interesting to note that Delta and Northwest were not the most efficient carriers, as measured by this ratio. Northwest, as a matter of fact, had the lowest ratio in both years, 1.16 in 1981 and 0.82 in 1978, though the latter was affected by a strike as noted on Chart III. What separates these two from the rest is the magnitude of the leverage ratio.

<sup>52</sup> See generally Graham & Kaplan, *Airline Deregulation is Working*, REGULATION, May-June 1982, at 26.

<sup>53</sup> For an articulate defense of airline deregulation, see Karr, *Airline Deregulation After Braniff's Fall*, Wall St. J., June 14, 1982, at 20, col. 3.

question the ability of certain air carriers, like Continental and Western, to survive unless conditions improve. Both carriers are now either in technical default of loan agreements or in danger of being so, unless lenders relax constraints in existing debt agreements.<sup>54</sup> Should the economy worsen, or interest rates increase, the situation could deteriorate beyond repair.

Several other factors must be considered, any or all of which could aid the carriers in their battle for survival. First, the demise of Braniff should help carriers like American and TWA, who fly in direct competition with that carrier. TWA and American have already begun to increase fares in markets where Braniff engaged in fare wars.<sup>55</sup> The shock of Braniff's insolvency may also serve to limit future fare wars. The remaining carriers should base their pricing strategies on economic analysis, as well as marketing considerations.

Second, lenders are loath to force the air carriers into liquidation. The worldwide market in used aircraft is already glutted and prices are falling. Bankers know their best interests may be served by being flexible in rescheduling airline debt.<sup>56</sup>

Third, fuel prices are stabilizing and interest rates are coming down slowly. Both factors are important to restored profitability and interest rates are crucial to the leverage factor. Fourth, if the economy rebounds, traffic will pick up and the tremendous built-up leverage of the industry will work in the carriers' favor, increasing Z scores in the process. Fifth, constructive mergers could help. Should the situation worsen substantially, the CAB might be pushed into permitting mergers between healthier carriers and the weaker in order to preclude future insolvencies.

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<sup>54</sup> INVESTMENT SURVEY, *supra* note 42, at 252, 258, 277.

<sup>55</sup> TWA, *American to Raise Fares on Braniff's Lines*, Wall St. J., June 3, 1982, at 2, col. 1.

<sup>56</sup> However, this did not help Braniff because its situation had deteriorated to such a great degree. Lenders did attempt to assist the Braniff by twice negotiating a deferral of principal repayments, forgiving some interest charges and waiving covenants requiring Braniff to maintain minimum net worth levels. See INVESTMENT SURVEY, *supra* note 42, at 251. Apparently Braniff concluded that its traffic had so declined that unless it filed for reorganization creditors would start seizing the aircraft. *Braniff Files for Reorganization*, AV. WEEK & SPACE TECH., May 17, 1982, at 29.

For their parts, the air carriers can and must act to improve their own situation. As the model suggests, leverage and operating profitability are crucial. Moves to cut operating costs and excess capacity will help. The air carriers must become more careful in their assessments of profit opportunities of expanding into new markets. The key still remains, however, the reduction of the tremendous built-up financial leverage in the industry. The air carriers must seize every opportunity to reduce this leverage by choosing equity finance wherever possible to insure the long run viability of the industry.

# **Commentary**

