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# Have the Major U.S. Air Carriers Finally Turned the Corner? A Financial Condition Assessment

by Richard D. Gritta and Brian Adams

*Rare prior to the deregulation of the airline industry, air carrier bankruptcies became rather endemic in the period 1982-2005. Since 1982, over 175 airlines have filed under the bankruptcy codes. This number includes eight of the carriers that were formerly referred to as "trunk carriers," now known as "Majors." Major carriers are defined as those with annual revenues exceeding \$1.0 billion. The purpose of this paper is to analyze the recent performance of these carriers using a statistical model specifically designed to predict the likelihood of financial stress for airlines. The paper will also update past research in this important industry to demonstrate the very precarious nature of profitability. The major reasons for the improvement of the industry's profitability will be briefly discussed. The analysis will show that the current financial condition of the industry has improved significantly due to increased concentration and the market domination of some carriers, very low fuel costs facing the carriers, and the record low interest rates resulting from the Federal Reserve's easy monetary policy. the industry may still be fragile or vulnerable to changes in these input factors.*

## INTRODUCTION

The past several decades have been an extremely turbulent era for the U.S. airline industry. The events of 9/11, the steep increase in the price of fuel, and the great recession starting in 2008 all interacted to heighten the financial stress facing all airlines. With the recent additions in the mid-2000s of ATA, Aloha, Champion, Skyline, Pacific Western Air, Legend Air and others, the number of bankruptcy filings had risen to over 175 by 2016. All have filed since the deregulation of the airline industry in 1978. The vast majority of the total has been the smaller airlines categorized by the Department of Transportation (DOT) as large and medium regional air carriers. The major carriers, however, have suffered significantly. DOT classifies carriers by groups based on total dollar operating revenues. Major carriers have revenues of \$1.0 billion or larger. The first filing was by the now defunct Braniff in 1982. The filings of major carriers (Braniff, Continental, Delta, Eastern, Northwest, PanAm, TWA, UAL, and USAir) have garnered the most attention for obvious reasons. Iconic carriers such as Braniff, Eastern, and PanAm have disappeared forever and the others have merged in order to survive. The purpose of this paper is to assess the current financial condition facing the major U.S. carriers as the U.S. economy continues to gain traction in 2016, outline briefly a few of the causes for what is found, and also to provide an overview of the risky nature of this industry.

## LITERATURE REVIEW AND METHODOLOGY

Applied financial ratio analysis has been around ever since there were income statements and balance sheets to assess. The quest, however, has been to combine these ratios into a score that could be useful in assessing the financial health of a firm over time. Beaver was the first (1966) to suggest that ratios analysis could have some predictive ability and utilized a univariate model using cash flow as the predictor. Altman (1968) then sought to advance the technique by developing the first generic bankruptcy scoring model using multiple ratios. Known as the Z Score, the model combined various balance sheet and income statement ratios using a regression technique known as Multiple Discriminant Analysis or MDA. The model was derived from data from a cross section of

different industries and has proven to be widely used (Altman 2006). Gritta (1982) used the model to predict the failure of Braniff and Continental before the events occurred. Altman et al. (1977) also sought to improve on Z Score with his ZETA® Model. Other techniques have been explored over the past several decades. Some researchers have used approaches such as Neural Networks (Zhang et al. 1999; Coats and Fant 1993), Genetic Algorithms (Carvalho and Freitus 2004; Varetto 1998), and Fuzzy Logic (Silva et al. 2005) in attempts to improve forecasting accuracy.

Models designed for specific industries, however, can be more powerful or accurate than generic models. Altman and Gritta (1984), for example, used the generic Altman ZETA® Model in assessing the U.S. air carriers,<sup>1</sup> but it was felt that models built on industry specific data might yield superior results. In fact, several researchers have used airline data to develop industry-specific models. One such model was called AIRSCORE (Chow et al. 1991). In addition, Gudmundsson (2002) employed a model which incorporated airline management variables that the author thought could further improve forecasting accuracy, and Silva et al. (2005) employed Fuzzy Logic to forecast air carrier stress. Finally, Pilarski and Dinh (1999) designed a model, called P-Score, specifically for air transportation. P-Score has the advantage that its inputs are readily available from data sources such as gurufocus.com and other sites. The P-Score model is a logit model that generates the probability of failure.<sup>2</sup> P-Score is calculated as follows:

$$(1) \quad W = -1.98X_1 - 4.95X_2 - 1.96X_3 - 0.14X_4 - 2.38X_5$$

Where:

$X_1$  = operating revenues/total assets (REV/TA= a turnover ratio)

$X_2$  = retained earnings/total assets (RE/TA=a past profitability ratio)

$X_3$  = equity/total debt obligations (EQUITY/DEBT=a leverage measure)

$X_4$  = liquid assets/current maturities of total debt obligations (CA/CL= a liquidity ratio)

$X_5$  = earnings before interest and taxes/operating revenues (EBIT/REV=profitability)

$$(2) \quad \text{The number P is determined by: } P = 1/[1+e^{-W}]$$

Financial analysts normally compute ratios which measure four aspects of financial health. Those measures are liquidity, leverage (use of debt finance), profitability, and turnover (efficiency). Several of the input ratios ( $X_1$ ,  $X_2$ , and  $X_3$ ) are ratios from the famous Altman Z Score model. Rather than producing a score that must be compared to a scale, as is the case with the previous models, this model produces the probability of bankruptcy. P is that probability. The higher the P value, the greater is the carrier's financial stress and the more likely it is to fail and vice-versa.

The majors assessed in this study are Alaska, American, Continental, Delta, JetBlue, SkyWest, Spirit, Southwest, United, and USAir. There have been a number of mergers that have affected the industry and thus this analysis. Northwest was merged into Delta, Continental into United, and TWA into American and recently USAir and American combined. All of these merged carriers have filed under the bankruptcy codes, in some cases more than once. Only passenger carriers are included in this study. All cargo carriers, such as FedEx, UPS, and DHL, are not.

Table 1 shows the application of P-Score to Southwest Airlines. The individual ratios are calculated from the carrier's income statements and balance sheets for the years 2003-2013. The source of the raw data was gurufocus.com. Southwest has always been regarded as the most profitable and stable airline in the industry, the result of superior operating strategies<sup>3</sup> and its far more conservative financial strategies over time.<sup>4</sup> This analysis clearly shows that excellent performance resulting from those operating and financial strategies. As the P-Scores indicate, its risk of failure has been the lowest relative to the rest of the carriers and is at or near 0%.

**Table 1: Southwest Air P-Scores**

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
<b>REV</b>	5,937	6,530	7,584	9,086	9,861	11,023	10,350	12,104	15,658	17,088	17,699
<b>EBIT</b>	483	554	820	934	791	449	262	988	693	623	1,278
<b>TA</b>	9,878	11,337	14,218	13,460	16,772	14,308	14,269	15,463	18,068	18,596	19,345
<b>RE</b>	3,883	4,089	4,557	4,307	4,788	4,919	4,983	5,399	5,395	5,768	6,431
<b>EQ</b>	5,052	5,524	6,675	6,449	6,941	4,953	5,466	6,237	6,877	6,992	7,336
<b>DEBT</b>	4,826	5,813	7,543	7,011	9,831	9,355	8,803	9,226	11,191	11,604	12,009
<b>CA</b>	2,313	2,172	3,620	2,601	4,443	2,893	3,358	4,279	4,345	4,227	4,456
<b>CL</b>	1,723	2,142	3,848	2,887	4,838	2,806	2,676	3,305	4,533	4,650	5,676
<b>X1</b>	0.601	0.576	0.533	0.675	0.588	0.770	0.725	0.783	0.867	0.919	0.915
<b>X2</b>	0.393	0.361	0.321	0.320	0.285	0.344	0.349	0.349	0.299	0.310	0.332
<b>X3</b>	1.047	0.950	0.885	0.920	0.706	0.529	0.621	0.676	0.615	0.603	0.611
<b>X4</b>	1.342	1.014	0.941	0.901	0.918	1.031	1.255	1.295	0.959	0.909	0.785
<b>X5</b>	0.081	0.085	0.108	0.103	0.080	0.041	0.025	0.082	0.044	0.036	0.072
<b>W</b>	-5.569	-5.132	-4.766	-5.094	-4.281	-4.506	-4.618	-4.979	-4.638	-4.750	-4.936
<b>P</b>	0.004	0.006	0.008	0.006	0.014	0.011	0.010	0.007	0.010	0.009	0.007

Source: Ratios and P values were calculated from raw data from gurufocus.com

Table 2 applies the model to the other major carriers for the years 2003-2013.

**Table 2: P-Scores 2003-2013**

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
<b>American</b>	0.270	0.264	0.279	0.212	0.156	0.305	0.444	0.391	0.527	0.568	0.480
<b>Delta</b>	0.255	0.618	0.777	0.929	0.087	0.661	0.438	0.333	0.310	0.279	0.070
<b>United</b>	0.674	0.711	0.999	0.135	0.107	0.479	0.504	0.316	0.161	0.205	0.150
<b>USAir</b>	0.175	0.255	0.266	0.037	0.028	0.202	0.241	0.115	0.102	0.064	merged
<b>Southwest</b>	0.006	0.008	0.006	0.014	0.011	0.010	0.007	0.010	0.009	0.009	0.007
<b>Alaska</b>	0.069	0.067	0.066	0.074	0.059	0.114	0.080	0.044	0.033	0.022	0.009
<b>JetBlue</b>	0.063	0.093	0.136	0.133	0.135	0.130	0.112	0.088	0.079	0.064	0.050
<b>SkyWest</b>	0.006	0.005	0.039	0.016	0.013	0.011	0.020	0.019	0.012	0.012	0.012
<b>Spirit</b>	na	na	na	na	na	0.449	0.203	0.103	0.001	0.001	0.000

Source: Calculated from raw data on gurufocus.com

Several important facts are evident from Table 2. Absent Southwest, Alaska, and SkyWest (the latter just recently defined as a major), the largest carriers have had a very turbulent history over the past decade and a half. The result has been the mergers mentioned above. The failed carriers, Continental, Delta, Northwest, TWA, United, and USAir, consummated mergers in order to survive.<sup>5</sup> While the events of 9/11 and the real estate crash causing the Great Recession have been responsible for dramatic increases in the likelihood of failure, American, Delta, and United, the three largest carriers, were still facing some problems according to the P-Scores. What really stands out is the ability of carriers, like Southwest and SkyWest to prosper in spite of 9/11 and the Great Recession. It does appear that the model shows an improvement in the carriers' financial health over the time horizon spanning 2003-2013. Further improvement has continued into late 2015. Table 3 lists the P-Scores for the carriers for the past almost two years. The 2015 results are for the third quarter of this year.

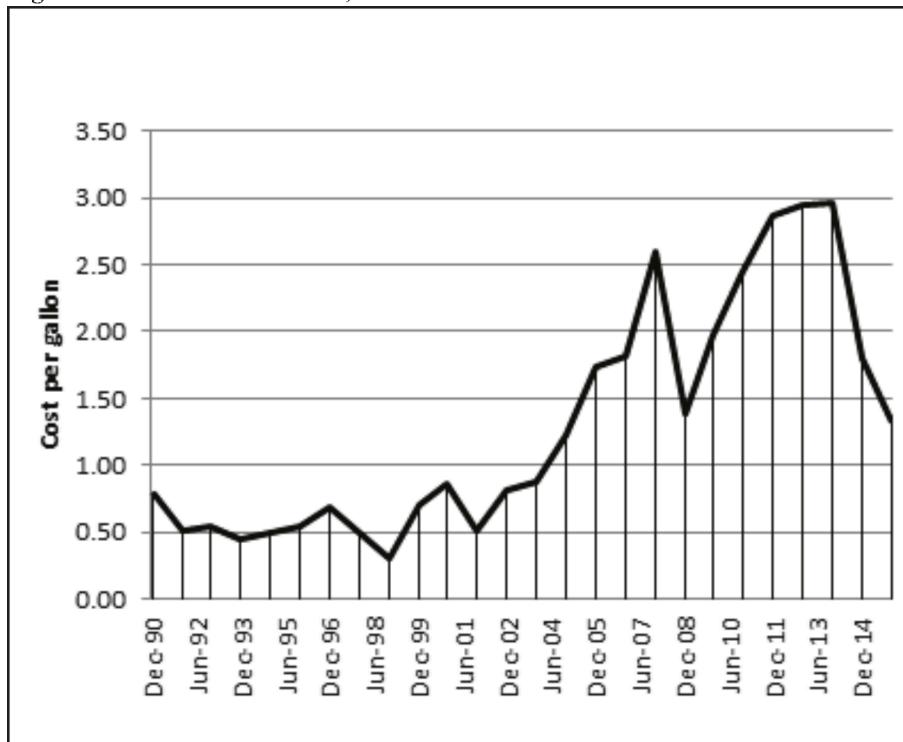
**Table 3: P-Scores 2014-2015**

	2014	2015
<b>American</b>	0.195	0.134
<b>Delta</b>	0.000	0.000
<b>United</b>	0.143	0.092
<b>Southwest</b>	0.004	0.000
<b>Alaska</b>	0.008	0.004
<b>JetBlue</b>	0.033	0.010
<b>SkyWest</b>	0.004	0.002
<b>Spirit</b>	0.000	0.000

Source: Calculated from data in carrier reports

The financial conditions of American, Delta, and United have dramatically improved, especially over the last several years, and the trends appears to be very positive. The big question is the “why” and the “whether if” this trend can persist and thus break the boom-bust cycle that has been so predominant in the history of this industry.

There seem to four major reasons for the significant improvement in the carriers’ financial condition. Two are more obvious. The first is that the economy has continued to grow, albeit somewhat slowly, out of the Great Recession. The second is the very low interest rates (due to Federal Reserve policies to assist the economic recovery) that have lowered the cost of capital to the carriers. The other two are not as obvious. The following figure shows the third key factor. Fuels costs have declined sharply due to the fall in oil prices to less than \$35 a barrel in December 2014.

**Figure 1: Aviation Fuel Prices, December 1990–December 2015**

The fourth factor is the greatly increased concentration in the industry. The significance of the mergers of Delta/Northwest, United/Continental, and American/USAir cannot be understated.<sup>6</sup> The industry has been moving increasingly toward an oligopoly situation. This has allowed carriers to control air fares in many markets, impose extra charges on virtually everything from baggage to food to aisle seats, and the level of services passengers must endure.

There are several widely accepted measures used to demonstrate the existence of an oligopoly. Two important standards are the four-firm and eight-firm concentration ratios. The concentration ratios show the percentage of domestic revenue passenger miles for each carrier. Table 4 shows the changes over time of the two measures. The four-firm and eight-firm concentration ratios have been used in many court antitrust cases to judge the presence of an oligopoly.<sup>7</sup>

**Table 4: Concentration Ratios Domestic Revenue Passenger Miles**

Year	4 Firm	8 Firm
1975	52%	81%
1980	50%	80%
1985	50%	77%
1990	52%	76%
1995	58%	77%
2000	56%	85%
2005	59%	86%
2010	61%	88%
2015	70%	84%

Source: Air Carrier Traffic Statistics – various issues

Clearly there is an oligopoly developing in the domestic market, and passengers have felt the effects noted just above.

## CONCLUSION

The purpose of this paper was to assess the current financial condition of the airline industry. The scores have proven to be good at indicating the impending changes in the financial condition of carriers over time. The P-Score model clearly does a good job of measuring financial strength, and the study shows the significant ups and downs of air carriers over the past decade.

What is the answer to the question posed in the title of this paper? Based on the P-Score analysis, it appears that all of the major carriers have substantially improved their financial condition over the past several years. All have benefited from several factors which have dramatically increased profits. These include the huge decline in the price of a barrel of oil, the record low interest rates, the mergers that have increased the concentration of the four largest carriers, and the gradual improvement in the U.S. economy.

The failure rate of air carriers over the past 30 years has simply been abysmal<sup>8</sup>, and the P-Scores clearly demonstrate the fact that the risk could once again increase should oil prices spike upwards, interest rates return to normal levels, or the economy falters. Things could also change should the USDOT and the Dept. of Justice choose to enforce anti-trust laws. In any case, the model is a tool useful to a wide audience involved with the air transport industry, including stockholders, bondholders, banks, lessors and other creditors, and governmental agencies that need to be able to gauge financial stress and the likelihood of future problems. Finally, the model can be of aid to one other group not mentioned above. That group is airline management. The models show the variables that are critical to successful financial performance. Management can thus center on actions that will

improve the variables key to reversing the low and negative trends in the ratios, at least in part due to managerial mistakes in the areas of financial leverage, liquidity, and profitability.

## Endnotes

1. Other researchers have built industry specific models; Brocket et al. (1994) in the insurance industry and Altman (1973) specified models for industries such as the U.S. railroad industry and for over-the counter securities dealers.
2. The AIRSCORE and P-SCORE models were generated using only air carrier data, but since the former requires data not readily available to the average person, this paper centers on the latter. AIRSCORE was developed by one of the current authors (Chow, Gritta, and Leung 1991). The International Center for Air Transportation at MIT [ICAT] has used the AIRSCORE model to track airlines, and both the U.S. Department of Transportation and the FAA have utilized two of the authors' models in the past. Neural Nets and Genetic Algorithms have also been designed to assess the airline industry. For a summary of these approaches, see: (Gritta, Davalos, and Adrangi 2006).
3. Lower costs per ASM (available seat mile) resulted from its hedging of fuel costs, its use of one type of aircraft (the B737), which minimizes pilot training expenses, and the carrier's better than average relationship with its union employees (at least in the past). In addition, while Southwest does use a hub and spoke system, it operates its system less rigidly than some other carriers.
4. Several studies have outlined the nature of risk in this industry and detailed Southwest's minimal use of long-term debt finance and its effect on carrier stability. See, for example: (Gritta, Adrangi, and Adams 2006) and Gritta, Freed, and Chou (1998).
5. A history of both the P-Scores and the Z Scores dating back to 1990 can be found in Goodfriend et al. (2004).
6. The combination of American and USAir resulted when the latter bought the former out of bankruptcy in spite of the fact that the combined carrier bears the American name.
7. Others are the Gini Coefficient, Herfindal Index, and Lorenz Curve. For a prior example applied to the air carriers, see Adrangi and Gritta (1986).
8. It is hard to find a major industry in the U.S. economy, especially one so important in the U.S. economy, that has suffered as high a failure rate as have the air carriers. The following major carriers have filed one or more times: American, Braniff, Continental, Delta, Eastern, Northwest, TWA, United, and USAir. In addition, other carriers classed as majors, formerly known as "trunklines" in the period 1970-1980, have filed. This list includes Braniff, Eastern, TWA, and PanAm (although the latter was classed as an "International." These have all disappeared and TWA was merged into American.

## References

Adrangi, B., and R. Gritta. "Deregulation and Concentration in Air Transportation." *Journal of the Transportation Research Forum* XVII (1), (1986): 6-11.

Altman, E.I. "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy." *Journal of Finance* 23(4), (1968): 589-609.

Altman, E.I. "Predicting Railroad Bankruptcies in America." *Bell Journal of Economics and Management Science*, (1973): 184- 211.

Altman, E., R. Haldeman, and Narayanan. "ZETA® Analysis: A New Model for Bankruptcy Classification." *Journal of Banking and Finance* XXVI (3), (1977): 24-56.

Altman, E.I., and Hotchkiss. *Corporate Financial Distress & Bankruptcy: Predict and Avoid Bankruptcy*. John Wiley & Son: 3<sup>rd</sup> edition, Hoboken, N.J. (2006).

Altman, E. and R. Gritta. "Airline Bankruptcy Propensities: A ZETA® Analysis." *Journal of the Transportation Research Forum* 25(1), (1984): 150-154.

Beaver, W. "Financial Ratios as Predictors of Failure." *Journal of Accounting Research* IV,(1966): 71-111.

Brockett, P.L., W.W. Cooper, L.L. Golden, and U. Pitaktong. "A Neural Network Method for Obtaining an Early Warning of Insurer Insolvency." *The Journal of Risk and Insurance* 61 (3), (1994): 402.

Carvalho, D.R., and A.A.Freitas. "A Hybrid Decision Tree/Genetic Algorithm Method for Data Mining." *Information Sciences* 163 (1-3), (2004): 13-35.

Chow, Garland, R. Gritta, and E. Leung. "A New Approach to Forecasting Financial Distress in Air Transportation: The AIRSCORE Model." *Journal of the Transportation Research Forum*. XXXI (2), (Spring 1991): 371-376.

Coats, P.K., and L.F.Fant. "Recognizing Financial Distress Patterns Using a Neural Network Tool." *Financial Management* (1993): 142-155.

Goodfriend, J., R. Gritta, S. Davalos, and B. Adrangi. "Assessing the Financial Condition of the Major U.S. Passenger Carriers Over the 1993-2003 Period Using the P-Score and Z" Scoring Discriminant Models." *Credit and Financial Management Review* X(4), (2004): 41-52.

Gritta, Richard D. "Bankruptcy Risks Facing the Major U.S. Airlines." *Journal of Air Law and Commerce* XLVII (Fall 1982): 89-108.

Gritta, R., N. Freed, and G. Chow. "Measuring the Degrees of Operating, Financial, and Combined Leverage Facing the U.S. Air Carriers: 1979-1995." *Transportation Law Journal* XXVI(1), (Fall 1998): 51-71.

Gritta, R., S. Davalos, and B. Adrangi. "A Review of Air Carrier Bankruptcy Forecasting Methodologies and Directions for Future Research." *Credit and Financial Management Review* XII (3) (2006): 11-30.

Gritta, R., B. Adrangi, and B. Adams. "Operating and Financial Leverage of the Major U.S. Air Carriers: 1990-2004." *Journal of the Transportation Research Forum* XLV(2), (Summer 2006): 16-24.

Gurufocus.com.

Gudmundsson, S. "Airline Distress Prediction Using Non-Financial Indicators." *Journal of Air Transportation* 7(2), (2002): 3-23.

Pilarski, Adam, and Thanh Tan Dinh. "Numerical Scoring Approach to Credit Risk Analysis." *Handbook of Airline Finance*, McGraw-Hill (1999).

Silva, Vladimir, Respico A. Spiritu Santo, and L. da Silva Portugal. "Using the 'Hybrid Financial Statement Analysis Technique' to Rate and Monitor Airlines Financial Status." *Proceedings of the Air Transportation Research Society*, World Conference on Transport Research. Paper presented in Rio de Janeiro, July 6, 2005.

Varetto, F. "Genetic Algorithms Applications in the Analysis of Insolvency Risk." *Journal of Banking & Finance*. 22(1998): 1421-1439.

Zhang, G., M.Y. Hu, B.E. Patuwo, and D.C. Indro. "Artificial Neural Networks in Bankruptcy Prediction: General Framework and Cross-Validation Analysis." *European Journal of Operational Research* 116, (1999): 16-32.

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