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Case Study

Altman's Z-Score in the Airline Business. Case Study of Major U.S. Carriers. Are they Potential Bankruptcy Candidates?

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Abstract

Over the last decade the U.S airline industry has experienced considerable shifts in operations conditioned by economic downturns both early in 2000s and from late 2007 until mid-2009 and historically high fuel prices which caused U.S air carriers to incur significant financial losses. These adverse developments in the airline industry during the last decade have even resulted in bankruptcy filings by several U.S biggest carriers, followed by mergers and acquisitions among them to become financially stronger and better cope with challenges created by changes in the economic environment. Therefore, the research paper places an emphasis on the analysis of possible bankruptcy for seven largest U.S airlines using Altman's bankruptcy prediction model (Z-score) for six consecutive years (2007-2012) based on the selected carriers' 10-k annual SEC filings. The results of the research showed that seven U.S largest carriers remain potential bankruptcy candidates despite all the recent improvements in the airline industry.

Keywords: *Airline business, Bankruptcy, Financial ratio, Earnings, Fuel prices, Economic downturn*

Introduction

The airline business is extremely susceptible to changes in the economic environment and market fluctuations. Therefore, the airline industry is characterized by unsteadiness being subject to many challenges including the high volatility in jet fuel prices and increasing labor costs. It is also characterized by susceptibility to events such as terrorist attacks, poor weather and natural disasters, as well as by seasonality [7]. Over the last decade the U.S airline industry has been significantly battered by a few events including terrorist attacks that occurred on September 11, 2001, economic recessions that U.S economy went into from March to November 2001 and from December 2007 to June 2009, and volatile and incremental jet fuel prices that have adversely affected financial conditions of major U.S carriers [8]. As a result, the last decade saw several filings for bankruptcy protection and mergers in the U.S airline business. The most noteworthy filings for bankruptcy protection in the U.S airline industry that took place in the last decade include those of Trans World Airlines in 2001 which was acquired by American Airlines, U.S Airways both in 2002 and 2004, United Airlines in 2002 Northwest Airlines and Delta Air Lines in 2005 and finally, the filing of American Airlines in late 2011 for the first time in the airline's history [9]. Interestingly, when faced by financial difficulties many airlines tend to merge with others to become financially stronger and better cope with challenges created in the airline business. Therefore, in recent years airline mergers and acquisitions have become more frequent in the U.S airline industry and occurred between American Airlines and Trans World (TWA) in 2001, US Airways and American West in 2005, Delta Air Lines and Northwest Airlines in 2008, Southwest Airlines and AirTran in 2011, United Air Lines and Continental Airlines in 2010, AMR Corporation and U.S Airways Group in 2013 [10].

The above listed filings for bankruptcy protection under Chapter 11 have produced an interest to analyze the likelihood of major U.S airlines' potential filings for bankruptcy in the nearest future using Altman's Z-score as a bankruptcy prediction model.

This paper thus discusses the Altman Z-score as a model used to foresee a possible bankruptcy and its applicability to determine whether U.S major airlines are considered as potential bankruptcy candidates. The calculation and analysis of Altman's Z-score is conducted for seven U.S carriers including Delta Air Lines, United Continental Holdings (United Air Lines), U.S Airways Group, AMR Corporation (American

Airlines), Southwest Airlines, JetBlue Airways and Alaska Airlines, over the six-year period. Furthermore, the paper briefly addresses the U.S airline industry on the whole and its recent developments.

Literature Review

Studies of bankruptcy based on the empirical evidence aim to identify financial characteristics of those companies that are likely to file for bankruptcy and distinguish them from those that are not. The goal of developing such bankruptcy prediction models is to foresee which companies will possibly file for bankruptcy a few years prior to the actual filing. The models that predict bankruptcy have been developed based on financial ratios derived from companies' financial statements [1]. One of the early studies of bankruptcy prediction was conducted in 1932 by Paul J. Fitzp Patrick (1932) who published his paper on bankruptcy titled Fitz Patrick 1932 in which he examined 20 matched pairs of firms, one bankrupt and one non-bankrupt and interpreted financial ratios indicative of bankruptcy. The data presented included 13 accounting ratios computed for 40 companies for the period of three years [2].

In the mid-1960s two types of models were developed. The early attempts to do research on bankruptcy were based on the univariate model which analyzes the relation between a certain financial ratio and bankruptcy [3]. One of the well-known researchers on bankruptcy using a univariate model was William Beaver (1966) who examined 29 financial statement ratios over the five-year period prior to bankruptcy based on the sample of 79 bankrupt and 79 non-bankrupt companies and attempted to identify financial ratios that had a discriminating power between those two groups and ascertain the years prior to bankruptcy during which those ratios begin to differ. Beaver (1966) identified the best discriminating six financial ratios including 1) net income plus depreciation and amortization / total liabilities, 2) Net income/total assets, 3) total debt/total assets, 4) Net working capital /total assets, 5) current assets/ current liabilities, and 6) cash, short-term investments, accounts receivable/ operating expenses excluding depreciation and amortization.

These ratios listed above analyze profitability, long-term solvency risk and short-term liquidity risk. Of those six financial ratios the ratio of net income plus depreciation and amortization to total liabilities best predicts the potential bankruptcy in Beaver's analysis. According to Beaver's study, the accuracy of predicting bankruptcy using the ratio of net income plus depreciation and amortization to total liabilities was 87% one year prior to filing for bankruptcy and 78% five years prior to the filing. The Type I error rate (a firm is classified as nonbankrupt but eventually files for bankruptcy) was 22 % one year prior to bankruptcy and 42% five years prior to bankruptcy whereas the Type II error rate (a firm is classified as bankrupt but does not go bankrupt) was 5% one year prior to bankruptcy and 4% five years prior to bankruptcy [3].

Since the univariate model considers financial ratios individually and examines the relation of each to bankruptcy, it does not assess bankruptcy risk using set of financial ratios as opposed to the multivariate analysis that combines several financial ratios to predict possible bankruptcy [1]. Therefore, the researchers turned towards using bankruptcy prediction models based on Multiple Discriminant Analysis that involves choosing a sample of bankrupt companies and matching them with non-bankrupt ones that approximate in size and operate in the same industry. Afterwards, Multiple Discriminant Analysis identifies set of financial ratios that best differentiate between the two groups and uses them to predict bankruptcy. The result of the analysis is a score obtained by summing the values of each financial ratio weighted by coefficients [1]. Possibly one of the best-known researches in the field of bankruptcy prediction based on Multiple Discriminant Analysis has been done by Edward Altman in 1968 who generated a Z-score that explains potential bankruptcy for publically traded manufacturing companies [4]. Moreover, Mcgurr (1996) and Rance (1999) applied their multiple discriminant analysis to retail firms. Nevertheless, most of the bankruptcy prediction models have been built for large publically traded companies due to the availability of all necessary information and use a pair-matched sample.

Apart from Univariate and Multiple Discriminant Analysis, there are three other types of bankruptcy prediction models including Logit & Probit Analysis, Recursive Partitioning Algorithm and Neural Networks. James A. Olson (1980) used logit regression for a large sample of firms without pair-matching [6].

Methodology

This research paper places an emphasis on the analysis of major U.S air carriers' potential bankruptcy using Altman's multiple discriminant model with a result of a Z-score for six consecutive years. Five financial ratios which are the inputs

in Altman's bankruptcy prediction model have been calculated based on the leading U.S airlines' financial statements taken from their 10-k form annual reports filed with the Securities and Exchange Commission and obtained from EDGAR database. Based on the resulting Z-score a conclusion is then drawn as to whether the selected leading U.S carriers remain potential bankruptcy candidates.

Altman's Z-Score as a Bankruptcy Prediction Model

In 1968 Edward Altman developed a bankruptcy prediction model using Multiple Discriminant Analysis (MDA). The generated Z-score is used to predict possible bankruptcy two years prior to the actual filing. The model was constructed using a pair-matched sample of firms, that is, one sample of bankrupt firms matched with another sample of nonbankrupt or healthy firms which have approximately the same size in the same industry. Altman's model of bankruptcy prediction combines five financial ratios with the best discriminating power weighted by coefficients estimated based on the set of companies that had gone bankrupt and companies that had survived. Altman developed its model using financial information for publically held manufacturing companies [4]. Altman's Z-score that puts together five financial ratios is generated using the following formula for publically traded firms.

Z-score = 1.2 X1+ 1.4X2+ 3.3 X3+ 0.6 X4+ 1.0 X5

X1 is the ratio of net working capital to total assets (Working Capital/ Total Assets), a component in the Z-score model that reflects liquidity, and the low value of this ratio may indicate that the company has liquidity problems which increase the possibility of the filing for bankruptcy.

X2 represents the ratio retained earnings to total assets (Retained Earnings/Total Assets) which reflects profitability and the company's ability to accumulate and reinvest earnings. The low value of this ratio may suggest that the company had difficulties accumulating earnings due to losses or small profits.

X3 is the ratio of earnings before interest and taxes to assets (EBIT/Total Assets) that reflects the operating efficiency before tax and financial leverage effects. In other words, this ratio represents the ROA measure.

X4 is the component of the Z-score model that considers security price fluctuations and represents the relation between market value of equity and total book value of liabilities (Market Value of Equity/Total Liabilities). The ratio shows how market assesses the firm's profitability and risk. Market value of the equity is defined as the market value of all common and preferred stock outstanding.

X5 is the ratio of sales to total assets (Sales/Total Assets), and the low value of this ratio bespeaks low effectiveness of assets utilization to generate revenue.

If the final score Z generated in this model is bigger than 2.99, then the company's financial condition is in the "Safe" zone. If Z is between 1.81 and 2.99, then the company's Z-score is in the grey area. And if Z is less than 1.81, the company is at the edge of bankruptcy, so-called "distress" zone and may file for bankruptcy protection over the following years. The low values of all components included in the Z-Score model may be a warning sign for stockholders and creditors [4].
In his initial test, Altman found out that the accuracy rate for a bankruptcy prediction one year prior to the filing constituted 95% with a Type I error rate of 6 % (predicted non-bankrupt when the firm defaults) and Type II error rate of 3 % (predicted bankrupt when the firm does not default). However, the accuracy rate for bankruptcy prediction two years prior to the filing was 83 % with a Type I error rate of 28 % and Type II error rate of 6% [4].

Over the past 30 years many tests have been conducted that resulted in Altman's bankruptcy prediction model being roughly 80-90% accurate in predicting the corporate default two years prior to the filing under Chapter 11 bankruptcy protection code [5].

Despite the fact that Altman's Z-score is easy to apply and includes various financial ratios, it is also criticized for not incorporating all important discriminating financial ratios. Moreover, the model has been built based on the accrual-basis balance sheet and income statement and does not take cash flow information into account [1].

U.S Airline Industry

U.S airline industry is highly competitive and dynamic which is attributable to the Airline Deregulation Act passed by Congress on October 24th, 1978. Prior to the passing of this law, the Civil Aeronautics Board, a government agency, was determining the route network for each airline and prices for air services. Nowadays, U.S air carriers can freely set their own prices for air

transportation services taking market conditions, the customer demand, operating costs and airline industry competition into account. Deregulation allowed new air carriers to enter into the airline business and provide scheduled air services. If in 1978 there were 43 certified carriers to provide air transportation, nowadays over 100 certified airlines operate in U.S airline industry. Deregulation resulted in the development of various operating models including low cost, hub-and-spoke and point-to-point network operations, as well as regional carriers that mainly operate flights at small distances for their mainline partners [7]. Legacy carriers founded before deregulation of the airline business face intense competition from low-cost carriers, as well as regional jet operators that operate in small and medium-sized markets. Major U.S airlines also highly compete with foreign carriers on many international routes.

Travelers benefited a lot from the airline deregulation in that increased competition resulted in discount fares and the spread of new air services. Since 1978 prices for air traffic services have plummeted down by more than 40 percent due to increase in the number of air carriers and the rapid expansion of route network [7].

Deregulation also contributed to the appearance of some marketing innovations. One of such innovations is frequent-flyer-loyalty program. There were other noteworthy innovations that followed deregulation. In particular, airlines developed code-sharing agreements with other air carriers, global distribution system and formed global alliances [7].

Being both capital-intensive and labor-intensive, the airline business is significantly susceptible to changes in global economic environment, bad weather conditions and natural disasters which adversely affect financial conditions of air carriers. Moreover, the airline business experiences seasonal instability. The history showed that the second and third quarters see higher demand for air travel resulting in higher revenues, then the first and fourth quarters when the demand for air travel usually lowers [7].

U.S airline industry has a vital importance for the U.S economy, and according to the report entitled "The Economic Impact of Civil Aviation on the U.S Economy" published by the Federal Aviation Administration (FAA) in August 2011, it alone contributes to the U.S economy by $ 150.5 billion (total added value) that constituted 1.1 percent of U.S GDP in 2009. In 2009 the economic output generated, the annual earnings provided and the number of jobs supported by U.S airline operations amounted to $296.6 billion, $ 91.9 billion and 2 million respectively[11].

In the last decade the U.S airline business saw significant decrease in profitability that even turned negative during the time of recession. Therefore, the following events that took place during the course of the last decade have highly affected U.S carriers' operations and have changed the course of the development of the airline industry. First of all, terrorist attacks on September 11, 2011 resulted in the decreased demand for air transportation affecting U.S airlines' financial operations. Second, economic recessions early in 2000s and 2007-2009 caused air carriers to incur significant losses due to decreased demand for air traffic. Moreover, over the last decade U.S air carriers have been struggling against volatile and incremental fuel prices and labor cost which have become the largest operating expenses and still remain a challenge for airlines thus limiting their capabilities to generate high profits [8]. Financial difficulties faced by U.S carries over the last decade caused some of them to file for bankruptcy protection under Chapter 11, including filings by Trans World Airlines (TWA) in 2001, U.S Airways both in 2002 and 2004, United Airlines in 2002, Northwest Airlines and Delta Air Lines in 2005 and finally the latest filing by American Airlines in late 2011. At last, to avoid bankruptcy and become financially better positioned and stronger, it is commonplace for airlines to merge with or acquire other airlines. In this respect, over the last decade U.S airline industry saw a few major mergers and acquisitions that occurred between American Airlines and Trans World (TWA) in 2001, US Airways and American West in 2005, Delta Air Lines and Northwest Airlines in 2008, Southwest Airlines and Air Tran in 2011, AMR Corporation and U.S Airways Group on December 9, 2013 [10].

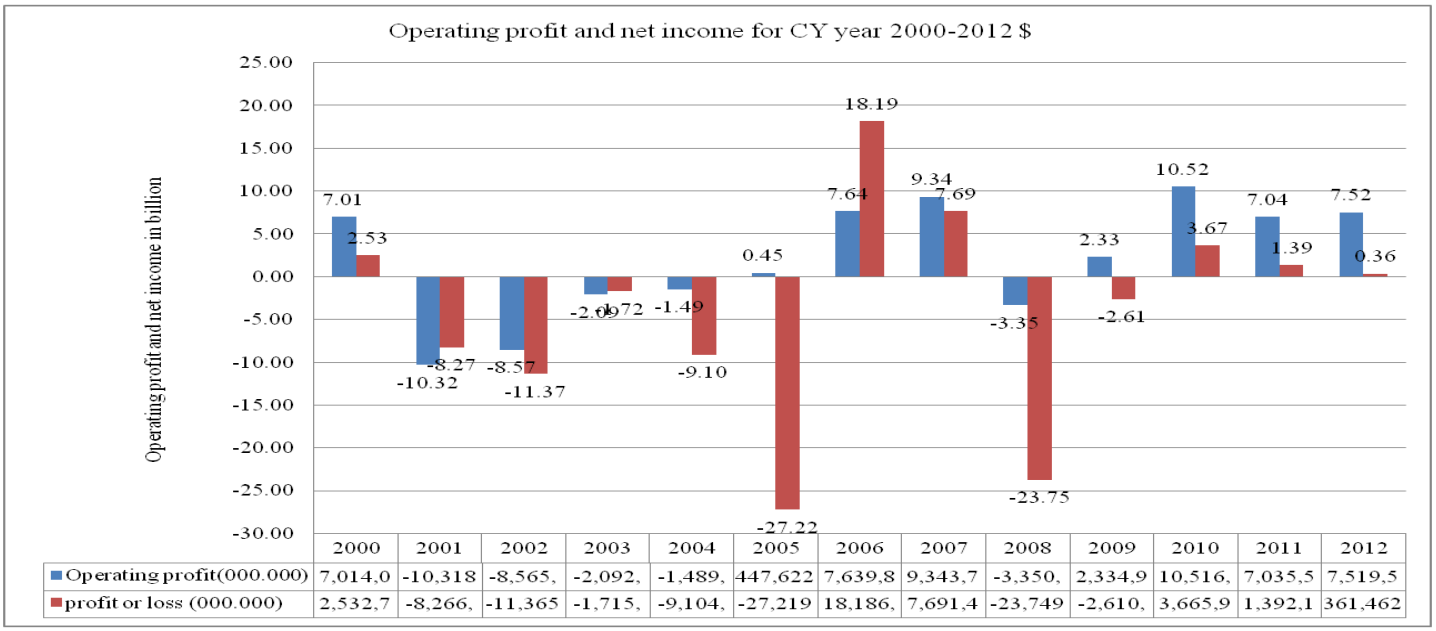
The following two figures show U.S carriers' operating profit and net income, as well as the trend in domestic and international fuel prices paid by U.S carriers for scheduled and nonscheduled services for the period 2000-2012.

Fig. 1 shows that U.S airlines incurred significant losses in 2001 and 2002 due to the economic recession and the aftermath of terrorist attacks. More losses were incurred in 2005 mainly as a result of skyrocketing fuel prices and consequences of hurricane Katrina that ravaged

the southern states [13]. The recent economic recession that lasted from late 2007 until mid-2009 also resulted in significant losses for the airline business as shown in Fig. 1. However, with the recovery of the U.S economy from the recession, the financial condition of air carriers improve despite the fact that profitability still remained low.

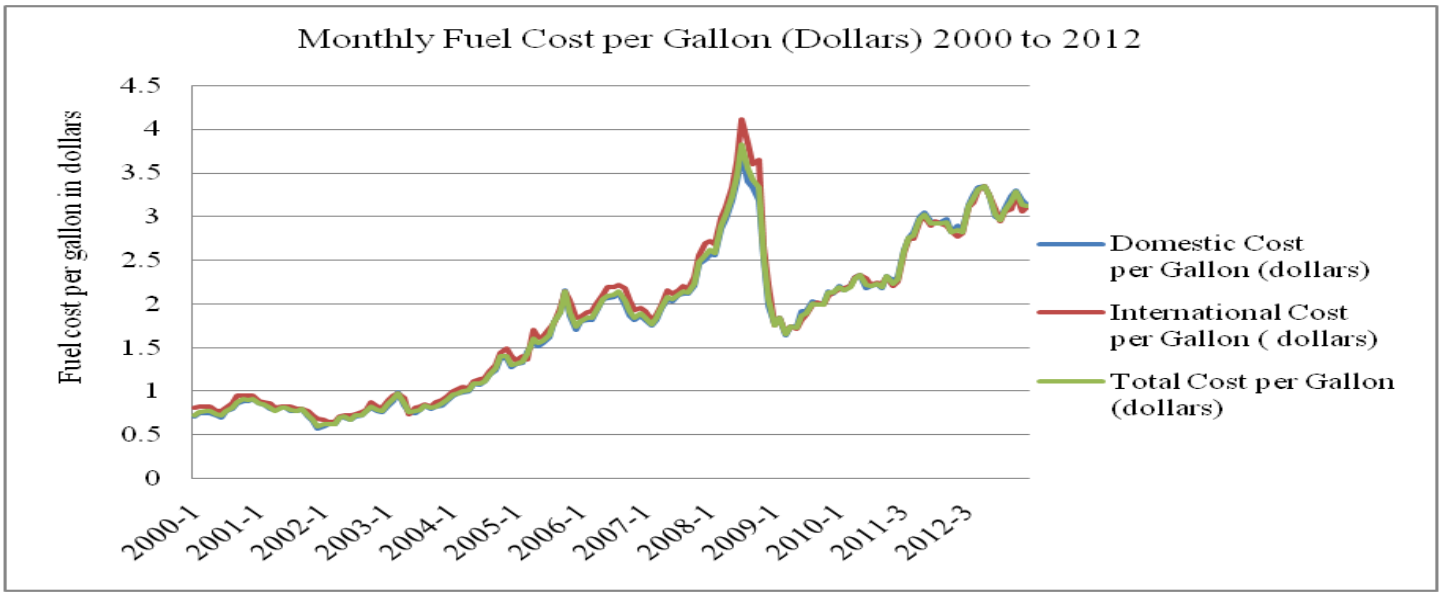
Fig. 2 shows the continuously increasing trend in fuel prices that reached record highs in mid-2008 (3.83$ per gallon) but subsequently began to plummet as a result of decreased demand for fuel during the economic recession. The improvements in the global economic environment slowly pushed fuel prices upward that continue to increase even today.

Fig. 1: U.S airlines' operating profit and net income for the calendar year, 2000-2012 [12]



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Operating profit(000.000)	7,014,0	-10,318	-8,565,	-2,092,	-1,489,	447,622	7,639,8	9,343,7	-3,350,	2,334,9	10,516,	7,035,5	7,519,5
profit or loss (000.000)	2,532,7	-8,266,	-11,365	-1,715,	-9,104,	-27,219	18,186,	7,691,4	-23,749	-2,610,	3,665,9	1,392,1	361,462

Fig. 2: Fuel cost per gallon (dollars) from 2000-2012 [15]



The Federal Aviation Administration estimated that the growth in the U.S airline industry will be moderate for the next five years due to slowly growing U.S economy and European economy. According to FAA forecast (Federal Aviation Administration) for fiscal years 2012-2032, the number of passengers is expected to reach one billion by 2024, and the airline industry will sustainably grow over the long run [14].

Research Findings and Discussion

Altman's Z-score described earlier has been calculated for U.S seven biggest airlines, both legacy carriers including Delta Air Lines, United Airlines, U.S Airways, Alaska Airlines, American Airlines which were founded prior to deregulation of the U.S airline industry, and two low-cost air carriers: Southwest Airlines and JetBlue Airways. The results of calculations of Altman's Z-score illustrated in the table 4 show that, for the most

part, all of the U.S legacy carriers had Z-score values less than 1.81 for six successive years which implies that they have been in so-called "distress zone" implying high likelihood of filing for bankruptcy protection in the following years which will definitely depend on the global economic condition, the growth rate of U.S economy and other major economies, demand for air transportation and of course volatility of jet fuel prices which remains a challenge for most of the U.S airlines. As shown in the table 4, among legacy carriers American Airlines has had the lowest Z-values for given six years which, in fact, explains American's filing for bankruptcy protection under Chapter 11 in November 2011.

According to Chapter 11 of the U.S Bankruptcy Code, the company does not cease its operations, but goes through reorganization process to settle its debt according to the proposed reorganization plan [16]. As opposed to Delta Air Lines, United Airlines and American Airlines, other legacy carriers such as U.S Airways and Alaska Air Group have higher Z-values despite being most of the part in the "distress zone". U.S Airways' Z-value for 2012 approximated 1.81 while Alaska's Z-score has been increasing since 2009 and even exceeded 1.81 in 2012. Therefore, these two airlines are relatively less likely to file for bankruptcy protection in following years compared to other legacy carriers. As for low-cost carriers, JetBlue Airways' Z-values were also below 1.81 thus indicating high risk of bankruptcy. Unlike JetBlue Airways and legacy carriers, Southwest Airlines which is the largest low-cost airline in the world has the highest Z-score values which were close to 1.81 in 2008 and 2007 but higher than 1.81 in 2009, 2010 and 2012. Therefore, this tells us that Southwest was in "grey zone" in those years which implies that it is not safe, but does not face high risk of bankruptcy.

In Altman's analysis the ratios of working capital to total assets, retained earnings (accumulated deficit) to total assets, EBIT to total assets have a significance importance in estimating potential bankruptcy. Low Z-score values for selected U.S airlines as shown in the table 4 are conditioned by the following factors: first of all, the ratio of working capital to total assets has been either negative or very low for all the years presented which may indicate that U.S airlines have had liquidity issues. Second, most of the legacy carriers except Alaska Air Group, Inc. have the negative ratio of retained earnings to total assets as a result of accumulated losses mainly incurred during the recession in 2008 and 2009. This

implies that legacy carriers have not been able to accumulate and reinvest as the profit made during the period following the recent recession has been used to cover the accumulated losses incurred in prior years. Alaska Air Group has reported positive ratio of retained earnings to total assets over the six-year period despite incurring financial loss in 2008.

As far as low-cost airlines are concerned, both JetBlue Airways and Southwest Airlines have a positive ratio of retained earnings to total assets which indicates that both airlines, in particular Southwest Airlines, all these years have been able to accumulate and reinvest the remaining profit in the face of the recent economic downturn. Nonetheless, the negative and low values of the ratio of retained earnings to total assets generally indicate low profitability in the U.S airline business.

Thirdly, the ratio of earnings before interest and taxes to total assets which reflects the profitability and the operating efficiency has generally been low for the selected U.S airlines as well over the six-year period that again bespeaks a low level of operating profitability and operating efficiency before taxes and financial leverage due mainly to skyrocketing fuel prices and increasing labor costs, for they represent largest operating expenses for U.S airlines.

In addition, Standard & Poor's provides credit ratings for the selected U.S airlines which are presented in the table 3.

Table 3: Standard & poor's credit ratings for U.S largest airlines

Standard & Poor's Credit Ratings for both local and foreign long-term credits			
	Credit rating	**Description**	**Rating date**
American Airlines Group, Inc (AMR Corporation and U.S Airways Group)	B	More vulnerable to adverse business, financial and economic conditions but currently has the capacity to meet financial commitments.	09 Dec. 2013
United Continental Holdings, Inc	B		24. Sep. 2010
JetBlue Airways Corp.	B		13.Sep.2013
Delta Air Lines	BB-	Less vulnerable in the near-term but faces major ongoing uncertainties to adverse business, financial and economic conditions.	18 Dec. 2013
Alaska Air Group Inc.	BB+	Considered highest speculative grade by market participants. Least vulnerable to adverse business, financial and economic conditions.	17.Dec. 2013
Southwest Airlines Co.	BBB-	Considered lowest investment grade by market participants. Adequate capacity to meet financial commitments but highly subject to adverse economic conditions.	02. May. 2011

(Source: Standard & Poor's Rating Services)

American Airlines Group Inc. which has been formed by the merger between AMR Corporation (a parent company of American Airlines) and U.S Airways (a parent company of U.S Airways, Inc), United Continental Holdings Inc and JetBlue Airways have been given a speculative grade B which implies that they are more vulnerable to

adverse economic and financial conditions but are able to meet their financial commitments. Delta Air Lines, Inc with its BB- is less vulnerable to adverse economic and financial conditions but is subject to uncertainties in the short run. Alaska Air Group has received the highest speculative grade whereas Southwest Airlines compared to other major airlines holds a better position in terms of meeting its credit obligations with the investment grade BBB- that implies an adequate capacity to meet financial commitments and being subject to adverse economic conditions [17].

Table 4: Altman's Z-score for leading U.S airlines for years 2007-2012 as of December 31

Altman's Z-score for major U.S carriers 2007-2012 as of December 31								
In dollars ($)		**X1**	**X2**	**X3**	**X4**	**X5**		**Z-score**
Name of the airline	**Year**	**Working capital/ Total assets**	**Retained Earnings (Accumulated Deficit)/Total Assets**	**EBIT/Total Assets**	**Market Value of Equity/Total Liabilities**	**Sales/Total Assets**	**Market value of Equity as of Dec 31 (in millions)**	**Z-score = 1.2 X1+ 1.4X2+ 3.3 X3+ 0.6 X4+ 1.0 X5**
Delta Air Lines, INC	**2007**	(0.042)	0.010	0.034	0.195	0.591	4,348	**0.78**
	2008	(0.047)	(0.191)	0.003	0.180	0.503	7,965	**0.30**
	2009	(0.041)	(0.225)	0.002	0.205	0.641	8,922	**0.41**
	2010	(0.094)	(0.214)	0.062	0.249	0.735	10,521	**0.68**
	2011	(0.114)	(0.193)	0.051	0.152	0.807	6,836	**0.66**
	2012	(0.112)	(0.166)	0.059	0.216	0.823	10,101	**0.78**
Note: EBIT from operations excludes special charges. Z-values for the six consecutive years were less than 1.81 (high probability of bankruptcy)								
United Continental Holdings, INC	**2007**	(0.078)	0.006	0.038	0.195	0.832	4,172	**0.99**
	2008	(0.124)	(0.273)	(0.055)	0.071	1.037	1,543	**0.37**
	2009	(0.073)	(0.319)	(0.018)	0.101	0.874	2,169	**0.34**
	2010	(0.015)	(0.144)	0.042	0.206	0.589	7,813	**0.63**
	2011	(0.010)	(0.128)	0.061	0.173	0.977	6,246	**1.09**
	2012	(0.074)	(0.148)	0.036	0.209	0.987	7,762	**0.94**
Note: EBIT from operations excludes special charges. Z-values for the six consecutive years were less than 1.81 (high probability of bankruptcy)								
AMR corporation (American Airlines)	**2007**	(0.044)	(0.049)	0.036	0.135	0.803	3,493	**0.88**
	2008	(0.136)	(0.146)	(0.027)	0.106	0.944	2,977	**0.55**
	2009	(0.043)	(0.202)	(0.033)	0.089	0.783	2,574	**0.39**
	2010	(0.077)	(0.223)	0.012	0.089	0.884	2,594	**0.57**
	2011	(0.079)	(0.318)	(0.014)	0.004	1.005	117	**0.42**
	2012	(0.095)	(0.402)	0.021	0.009	1.057	268	**0.45**
Note: EBIT from operations excludes special charges. Z-values for the six consecutive years were less than 1.81 (high probability of bankruptcy). AMR filed for bankruptcy in 2011								
In dollars ($)		X1	X2	X3	X4	X5		Z-score
Name of the airline	Year	Working capital/ Total assets	Retained Earnings (Accumulated Deficit)/Total Assets	EBIT/Total Assets	Market Value of Equity/Total Liabilities	Sales/Total Assets	Market value of Equity as of Dec 31 (in millions)	Z-score = 1.2 X1+ 1.4X2+ 3.3 X3+ 0.6 X4+ 1.0 X5
U.S airwyas group (U.S airways**)**	**2007**	0.099	(0.012)	0.079	0.205	1.455	1,353	**1.94**
	2008	(0.087)	(0.324)	(0.153)	0.114	1.680	881	**0.69**
	2009	(0.061)	(0.341)	0.023	0.100	1.403	779	**0.99**
	2010	0.009	(0.262)	0.101	0.210	1.523	1,622	**1.62**
	2011	(0.013)	(0.237)	0.054	0.100	1.566	821	**1.46**
	2012	0.030	(0.143)	0.095	0.256	1.472	2,201	**1.77**
Note: EBIT from operations excludes special items and goodwill impairment. Z-values for the last three years were less, but close to 1.81 (Relatively less probability of bankruptcy)								
Southwest Airlines Co.	**2007**	(0.024)	0.285	0.047	0.912	0.588	8,967	**1.66**
	2008	(0.011)	0.350	0.032	0.700	0.784	6,379	**1.79**

	2009	0.046	0.348	0.018	0.963	0.725	8,492	**1.91**
	2010	0.063	0.349	0.064	1.051	0.783	9,696	**2.19**
	2011	(0.010)	0.299	0.046	0.591	0.867	6,617	**1.78**
	2012	(0.023)	0.310	0.043	0.644	0.919	7,475	**1.86**
Note: EBIT from operations excludes special items. Z-values were both higher and a bit less that 1.81 (Grey zone, neither safe, nor high possibility of bankruptcy)								
Jet blue Airways Corp.	**2007**	(0.025)	0.029	0.030	0.235	0.508	1,074	**0.76**
	2008	(0.020)	0.010	0.019	0.406	0.563	1,931	**0.86**
	2009	0.058	0.019	0.044	0.317	0.503	1,586	**0.93**
	2010	0.040	0.033	0.051	0.395	0.573	1,950	**1.07**
	2011	0.031	0.043	0.046	0.276	0.637	1,466	**1.05**
	2012	(0.072)	0.061	0.053	0.310	0.705	1,607	**1.07**
Note: EBIT is from ongoing operations and excludes non-recurring items. Z-values for six successive years were less than 1.81 (high probability of bankruptcy)								
In dollars ($)		X1	X2	X3	X4	X5		Z-score
Name of the airline	Year	Working capital/ Total assets	Retained Earnings (Accumulated Deficit)/Total Assets	EBIT/Total Assets	Market Value of Equity/Total Liabilities	Sales/Total Assets	Market value of Equity as of Dec 31 (in millions)	Z-score = 1.2 X1+ 1.4X2+ 3.3 X3+ 0.6 X4+ 1.0 X5
Alaska Air Group, INC	**2007**	0.004	0.073	0.050	0.137	0.781	475	**1.14**
	2008	0.031	0.040	(0.018)	0.127	0.757	529	**0.87**
	2009	0.073	0.063	0.062	0.149	0.680	615	**1.15**
	2010	0.047	0.113	0.096	0.261	0.764	1,020	**1.45**
	2011	0.017	0.157	0.094	0.668	0.836	2,665	**1.79**
	2012	0.043	0.205	0.097	0.742	0.846	3,029	**1.95**
Note: EBIT from ongoing operations excludes special charges. Z-values most of the years presented were below, but coming close to 1.81, except 2012 when it exceeds 1.81. (relatively low probability of bankruptcy)								

Conclusion

The results of the research have showed that for the most part the Z-score values for the leading U.S airlines have been below 1.81 for six consecutive years presented in the table 4 which implies that there exists a risk of bankruptcy. Three biggest U.S airlines such as Delta Air Lines, United Continental Holdings and American Airlines that had Z-score values even had less than 1 in all six years presented whereas U.S Airways improved its Z-score coming closer to 1.81. Unlike other legacy carriers, Alaska Air Group, Inc which is relatively much smaller has been improving its Z-score which even exceeded 1.81 in 2012. AMR Corporation which is the parent company of American Airlines has the worst results of Altman's Z-score and eventually for the first time in its history filed for bankruptcy protection under Chapter 11 of the U.S Bankruptcy Code in November 2011, went through the reorganization process according to the bankruptcy plan proposed by any interested parties and approved by the court and emerged from bankruptcy on December 9, 2013 by merging with U.S Airways Group thus forming American Airlines Group Inc, the largest airline worldwide. JetBlue Airways have also been in the "distress zone" over the six-year period while Southwest Airlines, which is considered as the largest low-cost company in the world displayed the best results of Altman's Z-score among other air carriers, especially in 2010 when the Z-score reached 2.19. In 2012 Southwest was still in "grey" zone neither being considered safe, nor distressed, although the company might still face the risk of bankruptcy.

Over the last decade the U.S airline industry has been highly affected by economic recessions early in 2000s and from late 2007 until mid-2009 that resulted in decreased demand for air travel causing U.S leading airlines to incur significant losses, in particular in 2008. This, in fact, accounts for the negative or very low ratio of retained earnings to total assets for the seven biggest U.S airlines. U.S airlines industry has also been adversely affected by historically high fuel prices which along with slowing economy hinder the airlines' capability to generate significant profit.

In sum, we can conclude that according to Altman's bankruptcy prediction model, all of the selected U.S airlines except for American Airlines which has already filed for bankruptcy remain

potential bankruptcy candidates despite all the improvements in the industry. Undoubtedly, potential bankruptcy filings will hinge on the future demand for air transportation services, the degree of fuel prices volatility and the pace of growth of U.S and the rest of the world's economy.

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