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Do airlines always suffer from crashes?

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ABSTRACT

We examine the impact of aviation disasters on the stock prices of the crash airlines and their rival airlines. Results show that the crash airlines experience deeper negative abnormal returns as the degree of fatality increases. The stock prices of the rival airlines also suffer in large-scale disasters but benefit from the disasters when the fatality is minor.

1. Introduction

This paper shows that the influence of an aviation disaster on the post-crash equity value of airlines, both crash and non-crash, is closely related to the level of fatality involved. Results show that air crash disasters with a more severe fatality – more people killed in an accident – have a larger negative impact on the stock prices of the crash airlines over the post-crash period. However, the stock prices of the non-crash airlines benefit from such disasters when the fatality is minor.

The literature shows that air crashes reduce the market value of the equity of the crash airlines due to the loss of the aircraft and other costs incurred to handle the aftermath of crashes. Chance and Ferris (1987) show that the stock market responds instantly to air crash news. Borenstein and Zimmerman (1988) find that the shareholders of the crash airlines lose about one percent of their wealth. Air crashes adversely affect the stock prices of the crash airlines because they incur substantial financial losses during and after the disasters. Consequently, their stock prices plunge to reflect the decreases in the airlines' expected future cash flows.

In contrast, the direction of the impact of aviation disasters on the stock prices of the crash airline's rivals depends on the interaction of the "contagion" effect and the "switch" effect. On one hand, the "contagion" effect arises when the tragic air crash news also influences the business of the non-crash airlines if it provokes the general public's concern for air-travel safety, which results in a decline in the overall air travel demand (Gigerenzer, 2004; Silver et al., 2002; Sivak and Flannagan, 2004). Furthermore, after air crashes investors may anticipate upward industry-wide insurance rate adjustments (Mitchell and Maloney, 1989) and tightened industrial regulations (Chance and Ferris, 1987). Such increased operating costs reduce expected cash flows. On the other hand, the "switch" effect occurs when air travelers fly with the competitors of the crash airlines. The misfortune of the crash airlines benefits the non-crash airlines. Bosch et al. (1998) show that the "switch" effect (the "contagion" effect) is present for the non-crash airlines which have high (low) market overlaps with the crash airlines.

Our study relates the degree of severity of aviation disasters to the post-event stock prices of the airlines. For single-digit fatality disasters, the shareholders of the crash airlines suffer *immediate* wealth losses in the first post-crash week while the shareholders of the non-crash airlines *consistently* enjoy wealth gains over the entire post-event period, implying the dominance of the "switch" effect over the "contagion" effect. When the death toll climbs to a double-digit or a triple-digit number, all airlines experience significant reductions in equity value, indicating the "contagion" effect of the large-scale disasters within the entire airline industry. Higher degrees of fatality lead to deeper reductions in the market value of their equity.

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Table 1
Post-crash abnormal returns.

Date	AR	Patell test	Sign test	Window	CAR	Patell test	Sign test
Panel A: crash airlines ($n = 113$)							
0	−1.58	−6.658****	−4.151****	(0, 0)	−1.58	−6.658****	−4.151****
+1	−0.32	−1.468	−0.947	(0, 1)	−1.90	−5.752****	−2.832***
+2	−0.01	0.157	0.184	(0, 2)	−1.91	−4.600****	−3.774****
+3	−0.04	0.114	−0.193	(0, 3)	−1.95	−3.923****	−3.020***
+4	0.01	−0.621	−2.078**	(0, 4)	−1.94	−3.753****	−2.643***
+5	−0.46	−1.959*	−0.570	(0, 5)	−2.41	−4.191****	−3.020***
+10	−0.02	−0.038	−0.184	(0, 10)	−1.85	−2.955***	−1.323
+15	0.17	0.423	−0.758	(0, 15)	−2.13	−2.788***	−2.265**
+20	−0.39	−1.886*	−1.324	(0, 20)	−2.74	−3.121***	−2.265**
+25	−0.01	0.601	1.315	(0, 25)	−2.94	−3.074***	−0.946
Panel B: non-crash airlines ($n = 1, 199$)							
0	0.01	−0.472	−0.027	(0, 0)	0.01	−0.472	−0.027
+1	−0.14	−1.668*	−0.780	(0, 1)	−0.13	−1.515	−0.780
+2	−0.11	−1.760*	−2.343**	(0, 2)	−0.24	−2.254**	−1.590
+3	−0.02	−0.262	−0.664	(0, 3)	−0.26	−2.061**	−1.764*
+4	0.10	0.858	−0.606	(0, 4)	−0.16	−1.413	−1.706*
+5	−0.10	−1.887*	−0.838	(0, 5)	−0.26	−2.058**	−1.822*
+10	0.02	−0.078	−1.100	(0, 10)	−0.11	−1.295	−0.259
+15	0.20	2.239**	2.866***	(0, 15)	−0.03	−1.197	−1.590
+20	−0.04	−0.961	−0.548	(0, 20)	−0.31	−1.766*	−0.896
+25	−0.06	−0.288	−1.937*	(0, 25)	−0.36	−1.511	−0.086

AR is average abnormal return and CAR stands for cumulative average abnormal return. Figures are reported in percentage rate terms.
* Statistical significances at the 10% level.
** Statistical significances at the 5% level.
*** Statistical significances at the 1% level.
**** Statistical significances at the 0.1% level.

2. Data and methodology

We obtained the information on the U.S. air crashes that happened over the 1950–2009 period from the ASN Aviation Safety Database.[1] The airlines must meet the following criteria to be included in our sample. First, they must be U.S.-based companies listed on the NYSE, AMEX, or Nasdaq at the time of crash. Second, the company must have at least 140 pre-event daily prices available in the CRSP (The Center for Research in Security Prices) database. Third, only the crashes that have caused the death of either the aircraft occupants or people on the ground are investigated. To avoid confounding effects, our analysis eliminates the crash airlines with other significant corporate events within five days after a crash.[2] Our final sample includes 113 air crash disasters and 1199 non-crash airlines.

We classify all events into three categories based on the degree of severity of a disaster measured by the number of digits in the fatality figures. Inspired by the psychology literature, we use 10 and 100 as the cutoff fatality rates. Mitchell (2001) claims that the use of the decimal system suggests a natural tendency for people to think in terms of 10s and powers of 10. Grouping by the powers of 10 facilitates the mental order and provides computationally convenient breaks between groups. Increased psychological significance occurs at 10s and increasing powers of 10. Apart from reporting the actual numbers of deaths involved in accidents or disasters, the news media often describes the seriousness of events in terms of the number of digits of the death toll. Therefore, we use 10 and 100 as the cutoff fatality rates which may reflect the psychological levels of the public's perceived seriousness of fatality for the events. Our low-fatality group consists of disasters with single-digit numbers of fatality and involves 44 crash airlines and 465 non-crash airlines. The medium-fatality group includes the disasters that kill 10–99 people and affects 56 crash airlines and 600 non-crash airlines. The high-fatality group contains disasters with three-digit numbers of fatality and involves 13 crash airlines and 134 non-crash airlines.

The date that an air crash occurred is defined as the event day (day zero). If a crash happened on a non-trading day then the following trading day is used as the event day. The market-model is estimated over the time interval from 255 through 46 trading days prior to the event day. The abnormal return (AR_{it}) for airline i as of event date t is defined as:

$$AR_{it} = R_{it} - (\widehat{\alpha}_i + \widehat{\beta}_i R_{mt}), \tag{1}$$

where R_{it} is the actual stock return of the ith airline on day t, and R_{mt} is the return on the S&P 500 stock market index on day t.

The average abnormal return (AAR_t) of a group of airline companies is calculated as:

$$AAR_t = \frac{\sum_{i=1}^{N} AR_{it}}{N}. \tag{2}$$

The cumulative average abnormal return ($CAR_{T_1T_2}$) over an event window between days T_1 and T_2 is:

$$CAR_{T_1T_2} = \frac{\sum_{i=1}^{N}\sum_{t=T_1}^{T_2} AR_i}{N}. \tag{3}$$

3. Empirical results

Table 1 shows that both the crash and the non-crash airlines experience negative post-crash abnormal stock returns. A noticeable difference is that the stock prices of the crash airlines immediately react adversely to the disasters from the event date while the non-crash airlines begin to respond one day later. Panel A shows that the crash airlines lose 1.58% of their market value on the

[1] Available at http://aviation-safety.net

[2] We search in Factiva announcements of dividend payment, revenue or earning surprise, merger acquisition, new services, winning of major government contracts, change of key management personnel and filing of law suit for large damages within five days after a crash.