



Post-accident stock returns of aircraft manufacturers based on potential fault



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ABSTRACT

The literature has considered the market's response to the stocks of commercial airline carriers after their flights are involved in accidents. The aircraft manufacturer stock price, in the wake of a crash, has received considerably less attention in the literature. We analyze this response over a modern sample period and determine that a quick downturn of nearly 50 basis points of negative abnormal return accompanies the typical accident. Careful consideration of the cause of the accident, however, reveals a striking difference in market reaction based on the potential fault of the manufacturer. Market reactions are initially significantly negative when the manufacturer is judged to have potential fault in the incident but are otherwise insignificant. The market makes this determination even though there is often some ambiguity surrounding an accident's circumstances. We also find that manufacturer stock prices continue to drift significantly downward in the weeks following accidents that are deemed to potentially involve manufacturer fault. However, prices rebound significantly from the smaller initial downward reaction when no fault is linked to the manufacturer and actually demonstrate positive abnormal returns weeks after an accident.

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1. Introduction

Commercial airline crashes have served as an interesting topic of study in the financial markets because of their completely non-anticipatable nature. With no concerns regarding early leakage or other dissemination of information, researchers have been able to cleanly measure the market's financial valuation of these horrific events.

The vast majority of work in this area has concentrated on the stock responses of publicly traded commercial airline carriers after their aircraft, or their competitors' aircraft, have suffered a crash. Barrett et al. (1987), in an early event study, find complete market responses to the stock prices of airline carriers within a day of crashes. The average market decline for carrier stock prices is approximately –1.50% on the trading day following a crash, which is statistically significant, and the carrier stock prices exhibit neither further subsequent downward drift or a rebound in the days that follow. Barrett et al. (1987) report that results are more

potent for those crashes resulting in the highest losses of life. These results regarding the degree of fatalities are confirmed in a more modern study by Ho et al. (2013), who also consider the responses of stock prices of rival airline carriers to a crash. They find that competitor stock prices rise in the wake of smaller disasters, but high-exposure, devastating crashes actually result in a drag effect which lowers airline carrier stock prices throughout the industry.

Other authors have detected different impacts on competitor airline carrier stock prices in the wake of crashes. Bosch et al. (1998) find both instances of positive stock return bumps to competitor airline carriers in the wake of a crash, as well as market-wide downturns. The key distinction in their study is whether “competitors” actually serve the same markets and therefore provide alternatives for potential customers in the aftermath of a crash. Direct competitors, which do fly on the same commercial routes as the carrier with a recent crash, experience a positive price response, while those fellow carriers which are only “competitors” in the sense that they inhabit the same industry experience stock price declines via a spillover effect. Borenstein and Zimmerman (1988), meanwhile, detect no carrier competitor impact at all from commercial airline crashes. They also detail how the value lost to a carrier via stock price responses to an airline crash far exceeds the

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actual costs of the crash. These costs include the potential loss of customers, which they note seems to be small as consumers do not seem to shift their demand for commercial airline carriers much in the aftermath of disasters. This is later confirmed in a case study by Barnett et al. (1992) who find that after a DC-10 accident, demand for seats on subsequent DC-10 flights went down by a third for a few weeks, but subsequently recovered, and airlines never made any adjustment to discount their DC-10 seats in the interim.

Taking a broader perspective, Kaplanski and Levy (2010) further detail that the actual, more modern estimate for financial losses to the entire economy as a result of a crash is no more than \$1 billion. However, after substantial robustness measures are taken, the economy as a whole suffers an average loss of \$60 billion per aviation disaster, largely from market declines, based on a 10-disaster sample. This overreaction results in a subsequent rebound and is attributed to mood-type effects amongst investors similar to those noted by Saunders (1993) and Hirshleifer and Shumway (2003) regarding the weather, originating from the sentiment-type effects modeled by Barberis et al. (1998).

While much attention has focused on the stock responses of airline carriers to crashes, relatively little has been written regarding the response of airline manufacturers to these same events. This is our focus in this paper. Chance and Ferris (1987) detail a similar decline in airline carrier prices in response to crashes as seen by other authors, but they also consider the stock price responses of publicly traded airline manufacturers and find no stock price response. However, Chalk (1987) looks more deeply at the sample of airline crashes and uncovers a most interesting finding. After reading the accounts of airline crashes, Chalk (1987) determines, based on judgment, whether or not the cause of the disaster was linked to the manufacturer of the aircraft. The subset of crashes linked to the manufacturer (a minority of 23 crashes) sees an almost immediate negative abnormal return of -0.97% the first available trading day of the crash, and this cumulative abnormal return extends to -2.80% three days after the crash and -4.84% eight days after the crash. The control group of 53 crashes with no potential manufacturing issues experiences almost no negative abnormal return. This was even the case a generation ago when information regarding news events and financial data were not as quick to disseminate. The sample size of this study is understandably small and a generation removed; additionally, further developments have occurred regarding the measurement of abnormal returns in the years following Chalk's (1987) analysis.

Quite recently, Walker et al. (2014) also partly consider the response to manufacturer stock in the wake of commercial airline accidents in a wide-ranging piece. This study notes a link between potential mechanical failure hypotheses in the news media immediately following the crash and the amount of stock price reaction. However, our focus is the degree to which markets react initially, and then subsequently, following these disasters, based on the best information we have available, *ex post*. This means that for most accidents early in our sample, final findings of cause from regulatory agencies are likely available (in most cases, this allows for an easy classification of an accident as "caused" or "not caused" by manufacturing defect). More recent accidents may provide less concrete evidence for making a determination of cause, but we attempt to do so as best we can in these cases. We parse out the specific difference in market reaction to disasters, based on mechanical cause, or lack thereof, and we directly consider, for the first time, stock price drift/rebound subsequent to the initial reaction. While some accidents are likely to have mass media coverage of likely causes rather quickly, other accidents may be more puzzling to diagnose. On the whole, we are curious as to the process of the typical flow of information to the stock market, which is apt to react quickly to any potential news. In doing so we consider whether

"cause" or "no cause" accidents might be more likely to be quickly and correctly diagnosed by early media reports.

We are curious how quickly manufacturer stock prices reflect news of a crash and whether the cause of the crash plays a role in determining the dynamic of the market response. We consider these questions for the first time with a larger, modern sample via the recommended non-parametric tests for consideration of abnormal returns. These methods have yet to be utilized for analysis in the modern aviation disaster literature. We find heretofore undiscovered evidence detailing the importance of the distinction of the underlying cause of the accident. Those crashes potentially linked to some manufacturer issue experience significantly negative abnormal returns in the trading days following the crash. The reactions to accidents with no potential manufacturer fault are considerably less extreme, particularly after the initial trading day. This is a rather interesting result regarding market efficiency as the actual cause of airline crashes often takes years to formally ascertain for the National Transportation Safety Board (NTSB) or other government regulators. The marketplace appears to be relatively accurate in reflecting the causes of an airline disaster. Most strikingly, we find very different return patterns for manufacturers' stocks, after the initial downturn. Those incidents deemed to have some potential link (no potential link) to a manufacturing issue see the manufacturer stock price continue to drift gradually downward (rise statistically significantly upward) in the weeks following the accident. To our knowledge, this is a new result in the literature and lends a view of a heretofore undocumented degree of market efficiency in this special circumstance, as hypothesized by Fama (1970, 1991) and others.

2. Data and methodology

We begin by compiling a list of airline crashes, starting in 1980, and extending through October of 2013. We crosscheck three websites,¹ compiling events to generate our initial sample, and we then proceed by conducting an internet search detailing the incidents first taken from these lists. Only those incidents involving fatalities are included in the sample,² and only commercial aviation events involving the aircraft of manufacturers which are publicly traded, at the time of the incident, are included. We consider the market responses to incidents involving six publicly traded manufacturers: Boeing (96 incidents from 1980 to 2013); McDonnell Douglas (20 incidents from 1980 until its merger with Boeing in 1997); Lockheed Corporation, later Lockheed Martin (3 incidents from 1980 to 2013; however, following the merger of Lockheed with Martin Marietta in 1995 the focus of the company shifted totally to military aircraft, and therefore the number of observations relevant for our study is small, the last of which occurred in 1985. Prior to the merger, focus had already begun to shift to military aircraft.); Airbus (9 incidents, publicly traded from 2000 to 2013); Embraer (5 incidents, publicly traded from 2000 to 2013); and Bombardier (4 incidents, publicly traded from 1995 to 2013). These firms range in their time of inclusion in the sample due to mergers, restructuring, and public/non-public trading status, but we combine the incidents into one master sample in order to study our question of interest as broadly as possible. As a robustness measure, we separately consider only the cases of Boeing-

¹ http://en.wikipedia.org/wiki/List_of_accidents_and_incidents_involving_commercial_aircraft <http://planecrashinfo.com/database.htm> <http://aviation-safety.net/database/>.

² Like some previous authors, we consider whether the number of fatalities is linked to the market's response to the incident, but for our sample of manufacturers, this does not play a significant impact.

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