

Bin Laden's Death: Effect on US airline stock prices*

Mukund Kalani**

Ridhika Agrawal***

Abstract: The 9/11 attacks shocked the world and the stock market negatively. We hypothesize that the announcement of the death of Osama Bin Laden on May 2nd, 2011 would shock the stock markets positively. In order to investigate the effect of the death of Bin Laden on stock prices of US airlines we conduct an event study analysis using the Fama French Three Factor model. We use daily stock price data of nine publicly traded US airlines and find that our hypothesis is confirmed. Further, different airlines are differentially impacted by the shock. We conclude that there is a correlation between market size of an airline and the magnitude of the impact by the shock.

* We are grateful to Dr. Eric Ohrn for his assistance and helpful feedback.

** Corporate Finance, Economics Department, Grinnell College, IA 50112. Email: kalanimu@grinnell.edu.

*** Corporate Finance, Economics Department, Grinnell College, IA 50112. Email: agrawalr@grinnell.edu.

I. Introduction

The September 11 attacks in 2001 created an atmosphere of fear in the United States, causing a 14% drop in the S&P 500 and an overall negative reaction in global stock markets (Davis 2020). Anticipating major market chaos, which includes panic selling, major stock indices such as the New York Stock Exchange (NYSE) and the Nasdaq remained closed for a week after the attacks. On May 2nd, 2011, President Obama announced the death of Osama Bin Laden, who was deemed to be the mastermind behind the 9/11 attacks. To understand whether the announcement has any real-world repercussions, we use an event study methodology to evaluate how US airline stock prices respond to this announcement. Overall, we find that airline stock prices rise after this event. We also look at whether market size of US airlines (measured by international seat miles) has an effect on stock price changes and find that an increase in market size leads to an increase in stock price (measured by cumulative abnormal returns).

Chen and Siems (2004) find that terrorist attacks and military invasions negatively impact capital markets around the world. Specifically, in the case of the 9/11, they found that the attacks caused a 7.14 % drop in US stock indices. Our study analyzes whether acts of anti-terrorism have the opposite effect on capital markets. To our knowledge, there have not been any event studies surrounding the effects of Osama Bin Laden's death on stock markets. Therefore, in addition to providing one of the first event study evidences on this attack, our study can also provide important insights into how markets react to anti-terrorism events.

The rest of the paper proceeds as follows - section II describes the theory and hypothesis. Section III outlines the data and empirical framework. Section IV discusses the analysis and results. Lastly, section V concludes.

II. Hypothesis & Theory

We hypothesize that the stock prices of airline companies would increase. This hypothesis is based on two underlying assumptions about sentiments of perceived safety (Saad 2011): First, it could be that the news of Osama Bin Laden's death improves people's outlook towards air travel.

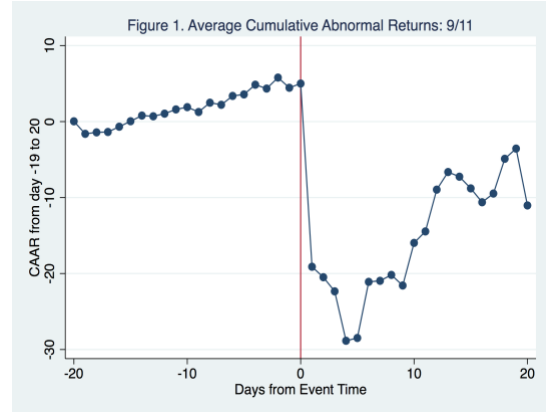
Second, we view Osama Bin Laden's death as a kind of an opposite event to the 9/11 attacks. The 9/11 attack shocked the market negatively, thus we would expect that the death of Bin Laden would shock the markets positively. This might be through an increase in perception of safety in the market, which might cause an increase in impromptu buying of airline stocks, which would increase airline stock prices. Based on the efficient market hypothesis this would be evidence for a semi-strong market, wherein the past trends as well as publicly available information, in this case President Obama's announcement, is reflected in the movement of the stock market.

In order to explore this further, we conduct an analysis on the effect of 9/11 on airline stock prices. We use the Fama French Three Factor Model to conduct this analysis, similar to the one that we will use to conduct the analysis for Bin Laden's death. The results confirm the fact that the 9/11 attacks caused a sharp decline in airline stock prices. From Figure 1 below, we can notice this sharp decrease in US Airline stock prices after 9/11, which is denoted by 0 on the x axis. Further, notice from Table 1 that the coefficients of average cumulative abnormal returns (CARs) are all negative. This negative sign signifies a sharp drop in the stock market.

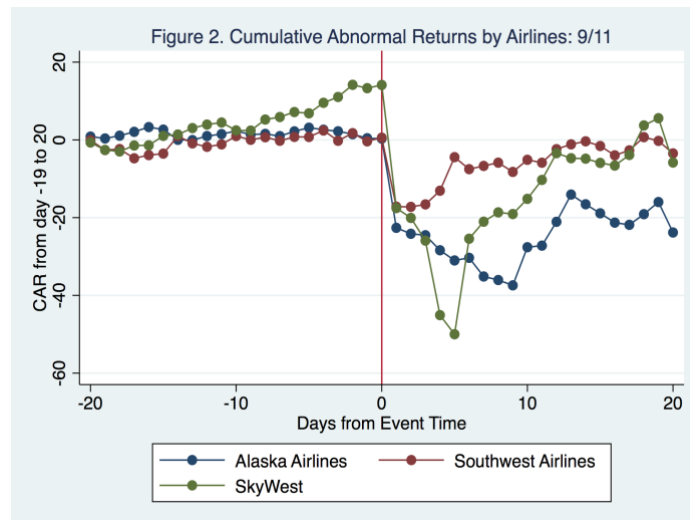
Table 1. Average Cumulative Abnormal Returns – 9/11

CAARs	3-day	7-day	14-day	20-day
Mean	-26.792**	-25.408**	-11.704*	-15.489*
Standard Error	-11.602	-16.536	-10.154	-11.026
Observations	3	3	3	3

* $p < .10$, ** $p < .05$, *** $p < .01$



Further, we hypothesize that bigger airline companies would probably be more sensitive to Bin Laden's death since they would be more exposed to market shocks. This is once again evident by the fact that during 9/11, bigger airlines had a sharper decline in their stock prices as opposed to smaller airlines. As can be seen in Figure 2, Skywest and Alaska Airlines had the biggest market shares, while Southwest had a relatively smaller market share, showing that bigger airlines are more sensitive.



III. Data and empirical framework:

A. Data

For this project, we collected daily stock price data from Yahoo Finance on nine public US airlines, namely, Alaska, Allegiant, American, Delta, Hawaiian, Skywest, Southwest, Jetblue and United airlines. We used data for all nine airlines to look at the effects of Bin Laden's death, but we had to restrict our sample to just Alaska, Southwest and Skywest for our analysis of 9/11.

We used Dr. Kenneth R French's website for data on Fama French Factors. Lastly, we used airline international seat miles data during 2011 from the Bureau of Transport Statistics to extend the results of our analysis.

B. Empirical Framework

In order to estimate the effect of Osama Bin Laden's death on US public airline prices, we use the Fama French Three Factor Model for our analysis with the following specification:

$$r = r_f + \beta_{market}(r_{market\ factor}) + \beta_{size}(r_{size\ factor}) + \beta_{book-to-market}(r_{book-to-market\ factor}) \quad (1)$$

Where, r_f is the risk free market rate, $r_{market\ factor}$ is the return on market index minus risk-free interest rate, $r_{size\ factor}$ is the return on small-firm stocks less return on large firm stocks and $r_{book-to-market\ factor}$ is the return on high book-to-market ratio stocks less return on low book to market ratio stocks. In order to estimate β_{market} , β_{size} and $\beta_{book-to-market}$ we use the actual stock price data from 100 days prior to the event window to predict abnormal returns. We then use this model to estimate r , which is the predicted rate of return for our event window.

The event was announced on May 2nd, 2011 by President Barack Obama. We define the event window as 19 days prior to the event and 20 days after the event. We choose 19 days prior, instead of an even 20 days since the data from delta on the 20th day before the event was extremely

high, and we consider it an outlier. It must perhaps be picking up on another shock, which is not related to our shock. In order to not cloud our data, we drop the 20th day before the event.

Next, we calculate the abnormal return based on the following equation:

$$abnormal_return = actual_return - r \quad (2)$$

Then, we add the abnormal returns to generate cumulative abnormal returns (CAR) across the event window. In order to get a compressed analysis, for our final results we average the cumulative abnormal returns over the nine different airlines and present it as average cumulative abnormal returns (CAAR).

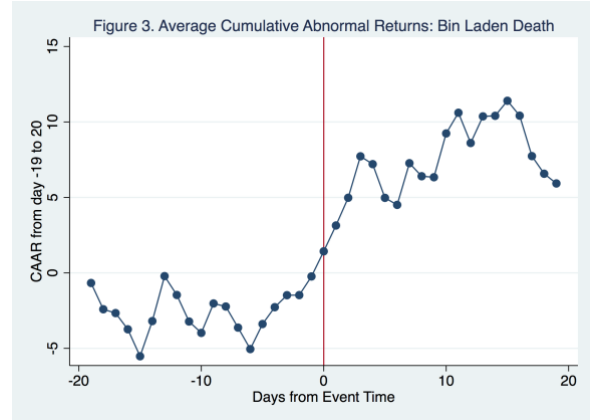
IV. Results

A. Primary Results

Using the methodology outlined above, we conduct the event study and find that airline stock prices rise after Osama Bin Laden's death. Specifically, average cumulative abnormal returns increase by 7.503 over the 7-day period after Bin Laden's death. The effects are long lasting and positive over the 3, 7, 14 and 20-day time periods. However, abnormal returns seem to come down after 14 days as we can observe in Figure 3. Nonetheless the positive coefficients are statistically different from 0 at the 1% significance level and suggest that average cumulative abnormal returns increase significantly after May 2nd, 2011.

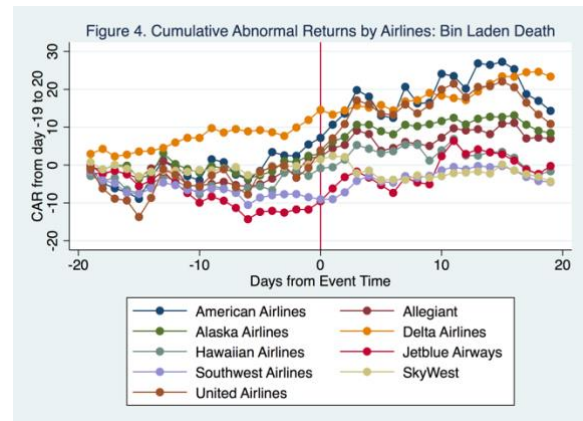
Table 2. Average Cumulative Abnormal Returns – Bin Laden Death				
CAARs	3-day	7-day	14-day	20-day
Mean	7.959***	7.503***	10.643***	6.160***
Standard Error	-5.895	-6.113	-7.600	-5.432
Observations	9	9	9	9

* $p < .10$, ** $p < .05$, *** $p < .01$



Looking at the data at a more granular level, we can see from Table 3 and Figure 4 that all airlines (except for Skywest) experience an increase in cumulative abnormal returns. As before, these effects reduce after the 14-day period but are still positive. We also observe that different airlines react differently to the news of Bin Laden's death. From Figure 4, it seems like the magnitude of increase in cumulative abnormal returns is higher for some airlines than others. We suspect that these might be airlines with higher market shares, therefore inherently more susceptible to changes from market shocks. We explore this hypothesis further using a simple empirical analysis in section IV B.

Table 3. Cumulative Abnormal Returns by Airline				
Airlines	3-day	7-day	14-day	20-day
American Airlines	14.350	15.208	21.028	8.880
Allegiant	7.285	4.275	6.354	5.163
Alaska Airlines	8.191	8.189	10.303	6.036
Delta Airlines	3.804	4.902	9.596	11.473
Hawaiian Airlines	8.134	8.209	6.247	1.208
JetBlue Airways	10.025	8.427	15.112	11.493
Southwest Airlines	4.315	5.564	7.929	4.011
SkyWest Airlines	-2.279	-3.975	-2.346	-4.432
United Airlines	17.807	16.728	21.564	11.610
Observations	4	8	15	20



B. Exploratory Regression Analysis Results

In order to explore the differential impact of Bin Laden's death on different airlines, we realized that it seems like larger airlines like Delta and American are more affected by this shock. Thus, we ran an ordinary least squares regression of the cumulative abnormal returns of each airline versus the percentage of international seat miles of airlines with the following setup:

$$CAR_a = \beta_0 + \beta_1 perc_seat_miles_a + \varepsilon_a \quad (3)$$

We used the percentage of international seat miles of airlines as a proxy for market size. β_0 is the constant, CAR_a denotes CAR for each airline a , $perc_seat_miles_a$ is the percentage of international seat miles of each airline and β_1 is the coefficient of interest. ε_a is the error term. It must also be noted that Allegiant and Southwest do not have any international seat miles since they operate domestically.

Upon running the regression model, as can be seen from Table 4 below, we find that a 1% increase in international seat miles increases CAR by 0.324 significant at the 1% level.

Table 4. Percent of International Seat Miles of Airlines vs. CARs	
	CARs
Percent of International Seat Miles	0.324*** (0.072)
Observations	351
Note: Standard errors in parentheses * $p < .10$, ** $p < .05$, *** $p < .01$	

V. Conclusion

In conclusion, we find that the 9/11 attacks had a strong negative effect on public US airline stock prices. Our analysis suggests that average CARs for US airlines following 9/11 fell by 25.408 7-days after the event. These results are also supported in the existing literature by Chen and Siems (2002). As can be seen in Table 1, the fall in average cumulative abnormal returns is significant

at the 5% significance level until 7 days after the event and at the 10% significance level 14 and 20 days after the event.

Next, to see if Osama Bin Laden's death had a reverse effect on US stock markets, we decided to conduct an event study analyzing the stock price effects of public US airlines after May 2nd, 2011. We find that average cumulative abnormal returns for US airlines following Bin Laden's death increased by 7.503 7-days after the event. This result confirms our hypothesis that Bin Laden's death increases the stock price of US airlines. Exploring our results further, we hypothesize that airline CARs differ by market size. We thus ran a regression analysis and found a strong positive correlation between airline size (measured by international seat miles) and cumulative abnormal returns.

Even though this study gives us a clear picture of the movement of airline stocks following Bin Laden's death, the availability of data on more publicly traded airlines will certainly improve the results of this study. Next, using data on the actual market share of airlines instead of international seat miles as well as incorporating some control variables can improve the results from our model in equation (3).

As many 9/11 studies have done, future research on the effect of Bin Laden's death or other anti-terrorism attacks can incorporate firms from Canada which would typically have similar characteristics to American firms to increase the sample size. To conclude, we find statistically significant impacts of Bin Laden's death on US airline stock prices; since this is one of the first event study analyses surrounding this event, there is room for future research.

References

Chen, Andrew H., and Thomas F. Siems. "The Effects of Terrorism on Global Capital Markets." *European Journal of Political Economy* 20, no. 2 (2004): 349–66.
<https://doi.org/10.1016/j.ejpoleco.2003.12.005>.

"Bureau of Transportation Statistics." Bureau of Transportation Statistics, May 4, 2020.
<https://www.bts.gov/>.

Davis, Marc. "How September 11 Affected the U.S. Stock Market" *Investopedia*. Investopedia US, 18 March 2020. Web. 18 April 2020.

French, Kenneth R. Kenneth R. French - Data Library. Accessed May 9, 2020.
https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Saad 2011 - Saad, Lydia. "Majority in U.S. Say Bin Laden's Death Makes America Safer." Gallup.com. Gallup, April 23, 2019. <https://news.gallup.com/poll/147413/majority-say-bin-laden-death-makes-america-safer.aspx>.

"Yahoo Finance - Stock Market Live, Quotes, Business & Finance News." Yahoo! Finance. Yahoo! Accessed May 9, 2020. <https://finance.yahoo.com/>.