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The Impact of Terrorism and Economic Shocks on U.S. Hotels

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by Cathy A. Enz, Ph.D., Renáta Kosová, Ph.D., and Mark Lomanno

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EXECUTIVE SUMMARY

Using data on 34,695 hotels from 2000–09, this study examines how the external shocks of the terrorist attacks on September 11, 2001, and the financial crisis of late 2008 affected aggregate occupancy, price (average daily rate), and revenue per available room (RevPAR) within the U.S. lodging industry. We found that the unexpected nature of these shocks did create fluctuations in occupancy and average daily rate, when controlling for the impact of other important hotel factors such as seasonality, segment, and hotel size, and for local economic factors. Although the industry was noticeably affected by the 2008 financial crisis, the impact of the 2001 attacks was both more negative and immediate in terms of drops in occupancy, ADR, and RevPAR. The isolated effects of the terrorist attacks were greatest immediately after the event, while the impact on hotel performance from the financial crisis worsened over time, with the most negative impact coming two months after the fall of Lehman Brothers. Exploring the differential impact of these shocks on various hotel segments revealed that higher-end hotels were more susceptible to their negative impact, but those hotels also made strong rebounds after four months. In contrast, limited-service midscale hotels were more negatively affected by the financial crisis than were midscale hotels that serve food and beverage. The reverse was true following the terrorist attacks.

ABOUT THE AUTHORS

Cathy A. Enz, Ph.D., is a professor of strategy and the Louis G. Schaeneman, Jr. Professor of Innovation and Dynamic Management at the Cornell University School of Hotel Administration (cae4@cornell.edu). Her research focuses on hospitality strategy, including innovation, competitive dynamics, pricing strategy, and change management. Among her recent publications are the best-practices series of case studies on innovators in the hospitality industry, with four coauthors, articles in the *Cornell Hospitality Quarterly*, and two new books *The Cornell School of Hotel Administration Handbook of Applied Hospitality Strategy* and *Hospitality Strategic Management: Concepts and Cases, 2nd edition.*

Renáta Kosová, Ph.D., is an assistant professor at the School of Hotel Administration, where she teaches strategy and international business courses. Prior to her arrival in 2007, she was on faculty at The George Washington University Business School. Her primary research focuses on the impact of globalization on firm behavior and competitiveness. Specific areas of interest include the impact of foreign direct investment and international trade on domestic firms in transitional economies. Additional research involves issues more central to the field of industrial organization, including firm/industry dynamics; determinants of firm performance and organization economics, with specific attention to franchising and service industries.

Mark Lomanno is CEO of STR Global, the leading authority on current trends in occupancy, room rate, and supply and demand data for the U.S. and global lodging industry. In addition to STR's own STAR reports, delivered to a global client base, Lomanno is a frequent contributor to industry publications, including *Cornell Hospitality Quarterly, Lodging Hospitality*, and *Hotel Management*. A frequent participant in industry conferences, he serves on the advisory boards of the HSMAI Foundation, Travel Industry of America, and the Cornell Center for Hospitality Research. He is also a frequent guest lecturer at the Cornell School of Hotel Administration (info@str.com).

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The collapse of the financial markets in 2008 and the devastating events of September 11, 2001, were manifestly damaging to lodging demand, as well as to other segments of the tourism industry. Lodging firms' stock prices dropped following the terrorist attacks in anticipation of declines in travel.[1] Likewise, in the recession triggered by the 2008 financial debacle, a fall in real disposable incomes of U.S. consumers led to a decline in aggregate demand for lodging products and services, as individuals curtailed discretionary travel. Most particularly, convention and business travel plummeted as part of a round of corporate cost cutting. The question in both of these situations was how badly the lodging industry was damaged, and when a rebound in demand would occur.

In the aftermath of September 11, for instance, commentators observed that the hotel industry would be seriously harmed by the tragic events as air transportation was disrupted and consumer confidence in safe travel was eroded. However, we find little systematic empirical research on the relationship between terrorism behavior and the tourism industry.[2]

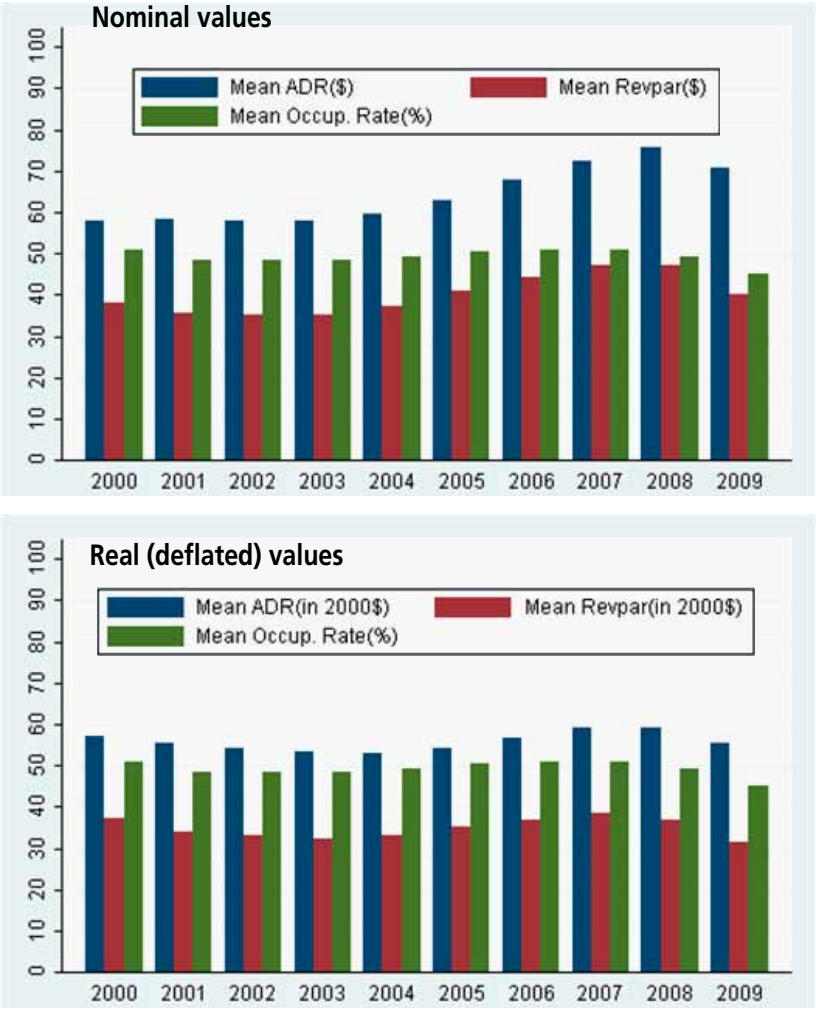
Unlike the terrorist attacks of 2001, the financial crisis of 2008 was the result of bank and insurance company failures that disrupted credit markets and evoked unprecedented government intervention. The crisis was thought to have culminated on September 15, 2008, the day after Lehman Brothers declared bankruptcy. We now know that this was only the beginning of economic difficulties, as the nation gradually recovers from recession, and global financial authorities continue their efforts to repair the financial system. In this study, though, we want to isolate the effects of the financial crisis, as separate from the subsequent recession.

[1] Bjorn Hanson, "All Stocks Decline as a Result of Terrorism," *Hotel & Motel Management*, Vol. 216, No. 18 (10/15/2001), p. 20.

[2] N. O'Connor, M. Stafford, and G. Gallagher "The Impact of Global Terrorism on Ireland's Tourism Industry: An Industry Perspective," *Tourism and Hospitality Research*, Vol. 8, No. 4 (2008), pp. 351-363; and Cathy A. Enz and Linda Canina, "The Best of Times, The Worst of Times: Differences in Hotel Performance Following 9/11," *Cornell Hotel and Restaurant Administration Quarterly*, Vol. 43, No. 5 (2002), pp. 41-52.

Exhibit 1

Annual U.S. hotel industry ADR, occupancy, and RevPAR, 2000–09



Again, we have seen few attempts to devise empirical models to isolate and then explore the effects of these events on hotel performance.[3] An exception is the work of Cam,[4] who examined industry indices and equity returns to find that the airline, hotel, and leisure industries exhibited negative abnormal equity returns following September 11. We sought to examine the performance of individual hotels versus overall industry indices, and to employ a longitudinal modeling approach that controls for both hotel characteristics and market factors.

Using data on 34,695 hotels from 2000–09 we explore how the terrorist attacks and the financial crisis affected aggregate occupancy, average daily rate (ADR), and revenue per available room (RevPAR) within the U.S. lodging industry. We argue that the unexpected nature of these shocks creates fluctuations in occupancy and rate, and that these jolts to the business environment will have a differential impact on various hotel segments (e.g., luxury vs. economy). To explore how long the impact lasted, we examined the duration of these shocks while controlling for all other factors that can affect hotel performance. While some external shocks have a short-term impact (e.g., a few days or weeks) others have longer lasting effects (e.g., months or years).

Aggregate Industry Data Patterns

As a baseline, we calculated overall ADR, occupancy, and RevPAR performance for each year from 2000 through 2009, using Smith Travel Research (STR) data for our sample of 34,695 hotels.[5] In Exhibit 1 the annual means are given in both nominal and real values. While nominal data rely on the face value of currency over the ten years, real values are corrected for inflation by adjusting them to the same monetary value as of January 2000 (the starting point of our sample) using the monthly Consumer Price Index (CPI) reported by the Bureau of Labor Statistics.[6] Comparing nominal and real values, it appears that both ADR and RevPAR were driven more by inflation during this period than by the shocks of 2001 and 2008. Average daily rates, for example, rose substantially in nominal values from 2004 through 2008, but the real values suggest more modest price fluctuations. In addition, occupancy appears to have dropped more substantially after the financial crisis in 2008 than after the events of September 11.

Monthly Variation in Performance—The Role of Seasonality

Looking at monthly variation helps us to understand the pattern of seasonality in the lodging industry and to explore the effects of the shocks in the context of these monthly patterns. Exhibits 2 and 3 provide monthly ADR, occupancy, and RevPAR values in both nominal and

[3] O'Connor *et al., op.cit.*; and B. Faulkner, "Towards a Framework for Tourism Disaster Management," *Tourism Management*, Vol. 22 (2001), pp. 135-147.

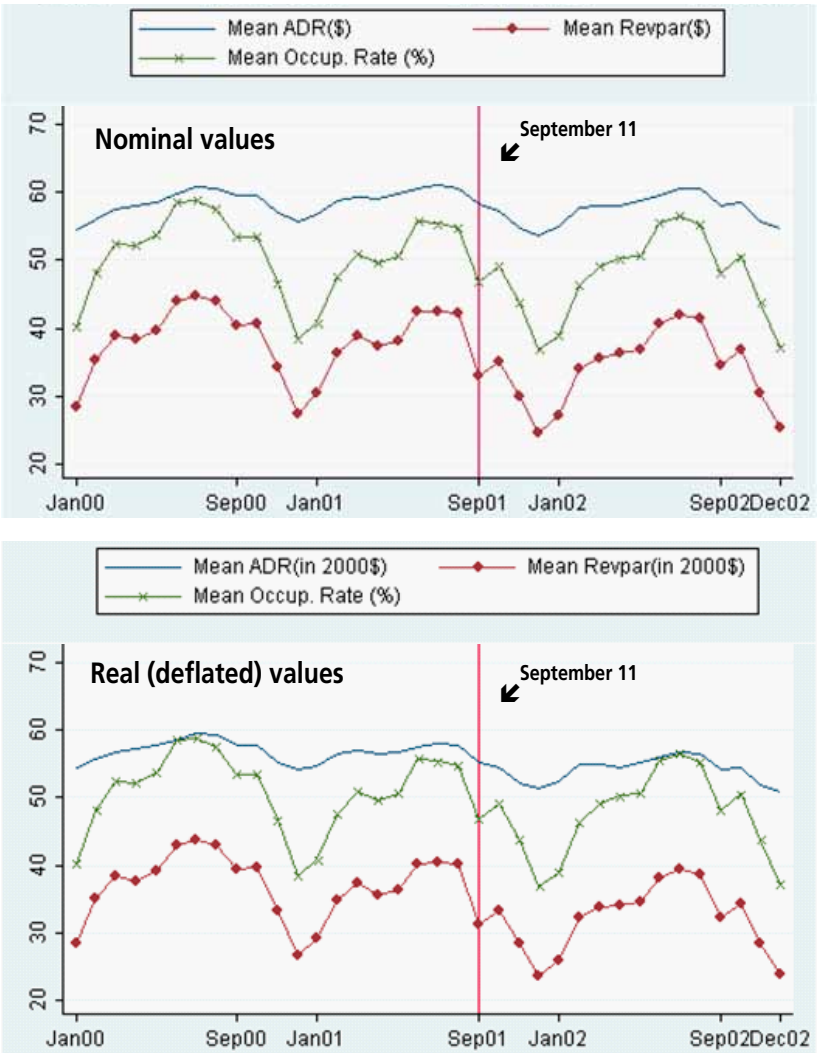
[4] M. Cam, "The Impact of Terrorism on United States Industries," *Economic Papers*, Vol. 27, No. 2 (June 2008), pp. 115-134.

[5] The results were similar when we included hotels that we ultimately had to exclude due to missing variables, for a total *N* of 35,987.

[6] See: ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt for more details.

Exhibit 2

Monthly U.S. hotel industry ADR, occupancy, and RevPAR, 2000–02



real values for the years before and after the terrorist and economic shocks. Looking at the effects of 9/11, Exhibit 2 suggests that overall seasonal or monthly dynamics were quite similar in 2000–02, with notable drops in occupancy and RevPAR after September 11. These seasonal data reflect the industry's diminishing performance in September, and to a greater degree in December and January, as well as the summer high season.

In both nominal and real terms we see strong patterns of seasonality in all performance measures. For this reason, we control for seasonality in analyzing the effects of 9/11 and the economic crisis. The data before and after the financial crisis (Exhibit 3, next page) suggest an impact that exceeds the usual seasonal dynamics, most notably, in occupancy. ADR appears to have declined more gradually after the crisis than did occupancy.

Differential effects on segments. To get a better understanding of performance variation by industry segment, we examined the mean performance variables by segment for the ten years of our study, as shown in Exhibit 4 (page 10). The segments' patterns of behavior shown in that graph suggest that our examination of shocks should also control for hotel segment.

To summarize, our analysis will control for the following potentially confounding factors: aggregate inflation, monthly seasonality, and segment differences. Additional market and hotel characteristics that are likely to affect performance must also be controlled in our examination of shocks to assure that factors other than these external jolts are not the real reason for shifts in occupancy, ADR, or RevPAR. We discuss these additional controls in the methodology section to follow.

Methodology

We obtained the following monthly hotel performance data from STR: room demand, room supply, ADR, occupancy rate, room revenue, and hotel census data stating hotel opening date, segment, operation type, and geographic location.[7] Monthly measures of performance (our dependent variables) for each hotel were ADR, occupancy rate, and RevPAR. ADR and RevPAR were deflated using monthly-price indexes from the Bureau of Labor Statistics (BLS) to obtain monthly real ADR and real RevPAR.

To control for time-varying market characteristics, we combined the STR data with the following annual information by county from the Census Bureau and Bureau of Labor Statistics. For each county, these variables include population (from the Census Bureau's annual population estimates); the unemployment rate (from the BLS); employment in arts, entertainment, and recreation; employment in food and drinking establishments; employment in the accommodation industry; and the number of establishments in the accommodation industry (all from the Census Bureau's County Business Patterns data). After data cleaning and dropping observations with missing values, our longitudinal sample covers 34,695 hotels, distributed across 2,283 counties, over periods of 12 months for the years 2000

[7] The STR database is essentially a census of U.S. hotels. We would like to thank the Center for Hospitality Research at the Cornell University School of Hotel Administration for facilitating our access to the STR data.

through 2009. The useable database included a total of 3,454,362 observations when the dependent variable is real RevPAR and 3,420,006 observations when the dependent variables are occupancy and real ADR.

To estimate the impact of September 11 and the financial crisis on hotel performance and to identify how much of the overall decline in performance observed in the aggregate data can be attributed to these events, we estimate the empirical model of the following general form:

$$Y_{imt} = \text{const} + Jolts_{mt} + HotelCharact_{imt} + MktCharact_{t} + Season_{m} + Year_{t} + m_{i} + e_{imt}$$

Where: *i* indexes hotel, *m,* months (1 –12); and *t,* years (2000–2009).

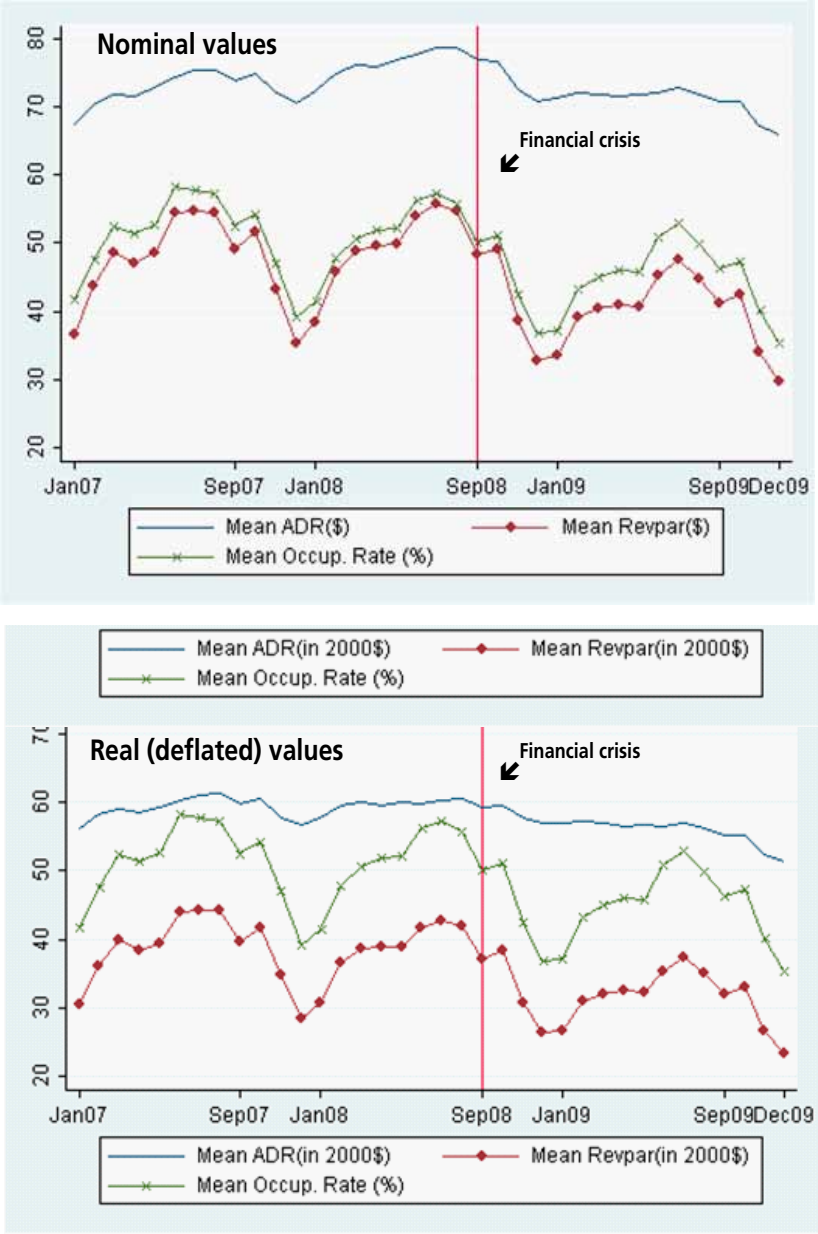
Y_{imt}—stands for our performance measures of interest; occupancy rate (stated as a percentage), real ADR, and real RevPAR.

$Jolts_{mt}$—represent the binary or dummy variable indicators (=1) for the month-year when the jolts occurred (i.e., September 2001 and September 2008). The coefficients of these dummies capture the immediate impact of the terrorist attack and economic crisis. To explore the duration, in later analyses we include dummy variables for the subsequent months. As indicated in our earlier discussion, we include in all our analyses the following control variables.

$HotelCharact_{imt}$—the set of hotel characteristics including hotel age; monthly hotel capacity or size (monthly number of room nights available);[8] binary indicators (dummies) for each segment (namely, luxury, upscale, midscale with F&B, midscale without F&B, and economy, as well as independent; and hotel operation type (i.e., whether hotel is operated under chain management, franchised, or operated by the independent owner) as classified by STR.[9] In addition, we also include one-month lags of occupancy when the dependent variable is real ADR (or real ADR when the dependent variable is occupancy) to account for customers' advance bookings (based on past-period prices) and hotels room-rate adjustments (based on previous

Exhibit 3

Monthly U.S. hotel industry ADR, occupancy, and RevPAR, 2007–09

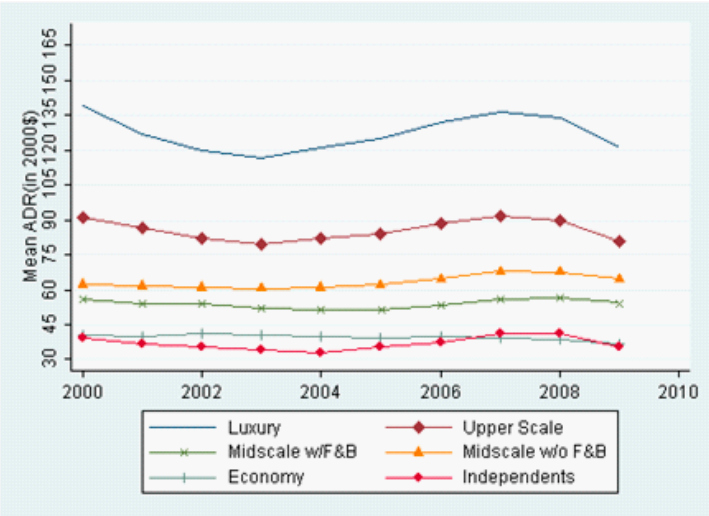


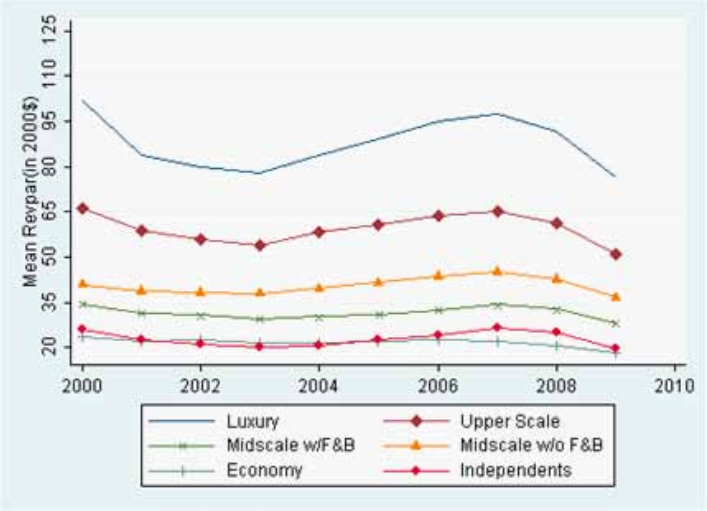
[8] We include hotel size, age, and population in logarithmic form to allow for a non-linear impact on performance and smooth out the potential impact of outliers as these variables have large range of values.

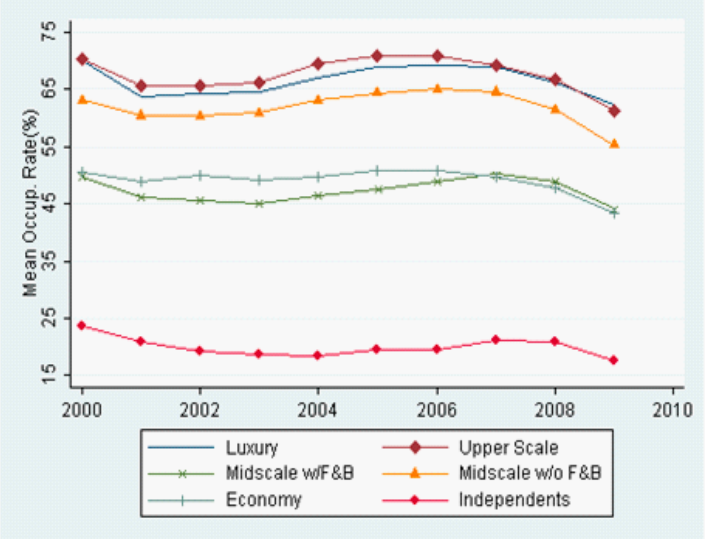
[9] These organizational form dummies might be endogenous; thus their impact cannot be interpreted as a causal effect in our analysis (so we do not discuss them in the result section). However, including them as controls in our type of analysis is helpful as they help us to capture (to us) unobserved changes in ownership and hotel organizational structure that could potentially bias the coefficients of interest, (i.e. environmental jolts). See: Renáta Kosová, Francine Lafontaine, and Rozenn Perrigot, "Organizational Form and Performance: Evidence from the Hotel Industry," SSRN (Social Science Research Network) Working Paper, 2010, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1034082; and for further discussion, see also: James Stock, "The Other Transformation in Econometric Practice: Robust Tools for Inference," *Journal of Economics Perspectives*, Vol. 24, No. 2(2010), pp. 83-94.

Exhibit 4

Monthly U.S. hotel industry ADR, occupancy, and RevPAR, by segment, 2000–09 (in 2000 dollars)







month occupancy). Controlling for these variables is important as it might be that hotel performance worsened not because the jolt occurred, but because at that time a hotel was already getting old and outdated, or had too few or too many rooms available in the given month, or low occupancy rates led hotel managers to offer price discounts in the following month.

$MktCharact_t$—the set of market characteristics that we measure for the 2,283 counties in our sample. Specifically, we include: population, unemployment rate, employment in related industries (arts, entertainment, and recreation; and food and drink), and employment and number of establishments in the accommodation industry.

$Season_m$—the set of binary indicators (dummies) for each of the 12 months to capture seasonal variation in performance typical for the hotel industry due to monthly or seasonal differences in tourism intensity or weather conditions.

$Year_t$—dummies for each of the ten years in our sample. They help us to control for (to us) unobserved aggregate changes in overall hotel demand or supply that may occur due to reasons other than environmental jolts, including changes in demographic or technology trends, changes in U.S. tourism, policy changes (e.g., immigration), or political changes (e.g., elections).

m_i—hotel-level unobserved heterogeneity (or hotel fixed effects); and e_{imt} is an idiosyncratic error term. Using a fixed effects methodology is important as it helps us to capture numerous (often unobserved) hotel attributes such as a good or bad hotel manager, specifics of hotel location (e.g., near beach, mountains, noisy corner of the street, or area with typically low or high taxes or real-estate prices), or brand affiliation. To ensure more robust results, beyond controlling for the variables noted earlier, we correct standard errors in all our estimations for heteroskedasticity and hotel-level clusters.

Results

Exhibit 5 (overleaf) shows the results from fixed-effects models estimating the impact of the terrorist attacks of 9/11 and the recent financial crisis on lodging performance, controlling for the factors that we discussed in the methods section. Not surprisingly, both external shocks had a significant impact on hotel performance. However, we can see that the effects due to September 11 were much greater than those resulting from the 2008 financial crisis. The terrorist attacks contributed to a 4.17-percent drop in occupancy rates.

Exhibit 5

Immediate effect of environmental shocks on U.S. hotel performance (2000–09)

Performance Metrics (Sample Means)	Occupancy (49.33%)	ADR ($55.88)	RevPAR ($34.91)
Impact of Environmental Shocks			
Terrorist Attack—September 11, 2001	-4.168*** [0.058]	-1.009*** [0.051]	-4.157*** [0.068]
Financial Crisis—September 2008	-0.796*** [0.048]	-0.281*** [0.047]	-0.696*** [0.050]
Hotel Characteristics			
ADR (one-month lag)	0.120*** [0.003]		
Occupancy (one-month lag)		0.188*** [0.003]	
Hotel Size (rooms available)	5.636*** [0.030]	6.905*** [0.056]	4.344*** [0.047]
Hotel Age	4.832*** [0.121]	-0.666*** [0.175]	5.148*** [0.146]
Hotel Segment (in comparison to Luxury)			
Upscale	-1.256*** [0.348]	-5.917*** [0.980]	-5.983*** [0.786]
Midscale w F&B	-3.851*** [0.402]	-12.288*** [1.293]	-12.681*** [1.007]
Midscale w/o F&B	1.123*** [0.430]	-10.446*** [1.300]	-8.424*** [1.018]
Economy	-3.112*** [0.412]	-14.830*** [1.324]	-13.863*** [1.031]
Independents	-3.627*** [0.420]	-12.004*** [1.477]	-12.429*** [1.132]
Market Characteristics			
Population	-1.210* [0.715]	8.572*** [1.126]	4.859*** [0.987]
Unemployment Rate	-1.001*** [0.028]	-0.941*** [0.036]	-1.547*** [0.035]
Level of employment in arts, entertainment, and recreation (in 1000s)	0.034*** [0.010]	0.088*** [0.023]	0.098*** [0.018]
Level of employment in accommodation sector (in 1000s)	0.029** [0.014]	0.160*** [0.019]	0.156*** [0.020]
Level of employment in food & drinking establishments (in 1000s)	0.069*** [0.007]	0.091*** [0.017]	0.147*** [0.014]
Number of accommodation establishments	-0.021*** [0.003]	0.007* [0.004]	-0.010*** [0.004]
Constant	9.475 [8.858]	-92.479*** [13.983]	-57.578*** [12.211]
Observations	3,420,006	3,420,006	3,454,362
R^2 (within)	0.544	0.470	0.264
Number of hotels (fixed effects)	34,695	34,695	34,695

Notes: Robust standard errors adjusted for heteroskedasticity and hotel clusters are shown in [brackets].
Significant at: *10%, **5%, ***1%.
ADR and RevPAR are deflated to express the monetary values in January 2000.
All regressions in addition include: set of seasonal dummies (i.e., dummy variables for each of 12 months), year dummies and hotel operation type dummies (i.e., whether hotel is operated under chain management, franchised, or operated by the independent owner as classified by STR). The results including full set of controls are available upon request.

Exhibit 6

Duration of effects of environmental shocks on U.S. hotel performance (2000–09)

Performance Metrics (Sample Means)	Occupancy (49.33%)	ADR ($55.88)	RevPAR ($34.91)
Impact of Environmental Shocks			
Terrorist Attack—September 11, 2001	-4.855*** [0.066]	-1.601*** [0.060]	-5.265*** [0.081]
1 month after (Oct. 2001)	-3.279*** [0.065]	-1.593*** [0.065]	-4.501*** [0.077]
2 months after (Nov. 2001)	-1.880*** [0.065]	-1.867*** [0.070]	-3.424*** [0.073]
3 months after (Dec. 2001)	-1.940*** [0.067]	-2.214*** [0.078]	-3.278*** [0.076]
4 months after (Jan. 2002)	-0.198*** [0.056]	0.435*** [0.053]	0.582*** [0.052]
Financial Crisis—September 2008	-1.552*** [0.053]	-0.254*** [0.051]	-1.436*** [0.056]
1 month after (Oct. 2008)	-1.721*** [0.056]	0.011 [0.050]	-1.603*** [0.057]
2 months after (Nov. 2008)	-3.638*** [0.058]	0.309*** [0.052]	-3.229*** [0.062]
3 months after (Dec. 2008)	-2.662*** [0.059]	0.522*** [0.066]	-2.709*** [0.063]
4 months after (Jan. 2009)	1.052*** [0.059]	3.353*** [0.068]	2.887*** [0.056]
Observations	3,420,006	3,420,006	3,454,362
R^2 (within)	0.545	0.470	0.265
Number of hotels (fixed effects)	34,695	34,695	34,695

Notes: Robust standard errors adjusted for heteroscedasticity and hotel clusters in brackets. Significant at: *10%, **5%, ***1%. # ADR and RevPAR are deflated to express the monetary values in January 2000. Besides reported coefficients all the columns include the same variables as specifications shown in Exhibit 5. The results including full set of controls are available upon request

Average daily rate dropped $1 (in real dollars), while real RevPAR declined $4.16. Given the mean values of ADR and RevPAR in our sample these estimates imply a 1.8-percent drop in rate and an 11.9-percent decline in RevPAR. These results suggest that the profound drop in occupancy rather than the modest decline in ADR drove the diminished RevPAR. By comparison, the effects of the financial crisis were relatively small. Occupancy diminished by .80 percent, real ADR fell only 28 cents, and real RevPAR dropped by about 70 cents. The R-squares—indicating the within hotel variation for each of the models are relatively large, given the panel nature of our data—so our models show a good fit and provide reliable estimates when explaining the variance in lodging performance.

Control Variables

Though the control variables are not the primary interest of our study, the reported coefficients in Exhibit 5 suggest that hotel characteristics such as size (i.e., monthly number of room-nights available), age, segment, and a hotel's previous-month ADR and occupancy are significant predictors of that hotel's current-month performance. We note, for instance, that the higher a hotel's price in the previous month, the higher its occupancy in the following month. We also see that greater occupancy in the prior month contributes to increases in prices in the following month, as indicated by significantly positive coefficient of lagged occupancy. Large hotels show better performance in terms of all three measures. Older hotels charge significantly lower (real) ADRs

Exhibit 7

Effects of environmental shocks on U.S. hotel occupancy rates by segment

Sample occupancy mean	Luxury 66.42%	Upscale 67.65%	Midscale w F&B 47.33%	Midscale w/o F&B 61.92%	Economy 49.09%	Independents 19.91%
Impact of Environmental Shocks						
Terrorist Attack—September 11, 2001	-14.328*** [0.246]	-9.737*** [0.227]	-4.969*** [0.154]	-4.738*** [0.123]	-2.704*** [0.133]	-2.883*** [0.133]
1 month after (Oct. 2001)	-7.163*** [0.269]	-5.482*** [0.240]	-3.813*** [0.163]	-3.108*** [0.130]	-2.570*** [0.132]	-1.947*** [0.124]
2 months after (Nov. 2001)	-3.756*** [0.247]	-3.086*** [0.234]	-1.955*** [0.164]	-1.416*** [0.129]	-1.632*** [0.134]	-1.401*** [0.123]
3 months after (Dec. 2001)	-3.004*** [0.263]	-1.628*** [0.235]	-2.050*** [0.173]	-1.449*** [0.132]	-2.348*** [0.138]	-1.435*** [0.139]
4 months after (Jan. 2002)	-0.035 [0.215]	0.417* [0.216]	0.228 [0.156]	-0.046 [0.117]	-0.747*** [0.106]	0.139 [0.124]
Financial Crisis—September 2008	-2.234*** [0.196]	-1.036*** [0.168]	-1.943*** [0.169]	-1.711*** [0.105]	-1.543*** [0.112]	-1.149*** [0.102]
1 month after (Oct. 2008)	-3.285*** [0.193]	-1.981*** [0.173]	-1.885*** [0.171]	-2.165*** [0.108]	-1.506*** [0.122]	-1.070*** [0.100]
2 months after (Nov. 2008)	-6.290*** [0.201]	-5.084*** [0.179]	-4.242*** [0.180]	-4.964*** [0.109]	-2.459*** [0.121]	-1.711*** [0.114]
3 months after (Dec. 2008)	-3.911*** [0.219]	-3.431*** [0.187]	-3.477*** [0.184]	-3.371*** [0.111]	-1.783*** [0.121]	-1.312*** [0.128]
4 months after (Jan. 2009)	-3.042*** [0.228]	-2.114*** [0.188]	1.502*** [0.178]	1.667*** [0.112]	2.869*** [0.116]	0.057 [0.121]
Constant	-79.279** [36.308]	9.671 [30.241]	-31.397 [24.801]	35.223** [17.405]	9.206 [17.885]	-11.388 [18.128]
Observations	193,098	285,952	490,841	843,291	996,653	61,0171
R^2 (within)	0.412	0.399	0.584	0.451	0.479	0.673
Number of hotels (fixed effects)	2,308	4,196	6,656	10,682	11,745	9,100

Notes: Besides reported coefficients all the columns include the same variables as specified in Exhibit 5. Robust standard errors adjusted for heteroscedasticity and hotel clusters in brackets. Significant at: *10%, **5%, ***1%. Since some hotels change segments over time the sum of hotels across segments is larger than 34,695 hotels in aggregate sample.

than newer hotels, but enjoy higher occupancy and higher (real) RevPARs on average. Looking at hotel segments, the coefficients of segment dummies are all significant, confirming important differences in performance between segments, as discussed earlier. Examining market characteristics, the results show that the unemployment rate, level of population within the hotel location, and employment in complementary industries such as the arts, entertainment, food and drink, and recreation all significantly affect hotel performance. As one would expect, hotel performance is lower in the counties with higher unemployment rates. Hotels in locations with larger populations, on the other hand, have higher ADRs and RevPAR but lower occupancies, which essentially shows the effects of a strong room supply. Hotels in markets with more accommodation establishments have significantly lower occupancy and real RevPAR on average. At the same time, higher employment in accommodation, restaurants, and other related industries is also associated with better performance of hotels, consistent with agglomeration spillovers (e.g., labor pooling) between different industries, as suggested by Alfred Marshall.[10]

[10] Alfred Marshall, *Principles of Economics*, 8th ed. (London: Macmillan, 1920). Though not reported due to space limitations, we also include the set of seasonal monthly dummies and year dummies in all our specifications. All the dummies were significant at 1% indicating important differences in performance across years and months, consistent with the aggregate industry patterns discussed earlier.

Duration of the Shocks

We explored the duration of the effects of 9/11 and the economic crises (that is, when the effects began to disappear) for a period of four months, as shown in Exhibit 6. After an immediate drop after September 11, occupancy had still not rebounded four months later. By January 2002, though, the drop attributable to 9/11 was quite small, about 0.2 percent, and the negative impact diminished in subsequent months. In contrast, the most noticeable drop in real ADR (about $2.20, or 4 percent on average) occurred in the third month after the attacks (that is, in December 2001). Rates recovered somewhat in January 2002, increasing about 44 cents that month. Real RevPAR followed occupancy down sharply in September, and gradually improved over the subsequent four months. Real RevPAR improved on average by about $0.60 after 9/11 in January 2002.

By contrast lodging performance after the financial crisis just got worse and worse for the three months after September 2008, although some improvement occurred in January 2009, when average occupancy ticked up by about 1 percent. The impact on ADR was modest in real dollar terms, and real RevPAR, like occupancy, diminished after the financial crisis, particularly in November and December 2008, when the average drop was roughly $3 (representing about 8.5 percent, given our sample mean).

Segment Analysis

The two events showed diverse effects on various hotel segments. Beginning with the effect on occupancy (Exhibit 7), the estimated coefficients reveal that luxury hotels were hardest hit in the first three months post September 11, followed by upscale hotels. During this period, the monthly drops in occupancy attributable to the 9/11 attacks ranged between 3 and 7.2 percent for luxury, and between 1.6 and 5.5 percent for upscale hotels. At the same time, economy and independent hotels were less affected by the terrorist attacks, with occupancy drops between 1.4 and 2.6 percent. Midscale hotels experienced only slightly larger drops due to 9/11, between 1.4 and 3.8 percent during the same three-month period. However, by January 2002 only economy hotels continued to show a significant, though tiny (0.7%) drop in occupancy due to the terrorist attacks.

Luxury hotels were again hit hardest by the financial crisis. While the impact of September 11 eased each month for luxury and upscale hotels, this was not the case after the financial crisis of September 2008. Instead, as we indicated above, the situation continued to deteriorate. All hotel segments were hardest hit in the second month (November) after the crisis. Four months after the start of the financial crisis luxury and upscale hotels still continued to experience reduced occupancy, albeit not as bad as in November (2 to 3 percent in January, compared to 5 to 6 percent in November). Economy and independent hotels were again the least negatively affected by the financial crisis, and the effect disappeared for independent hotels by January 2009. Economy and midscale hotels even experienced slight rises in occupancy in January 2009. Thus, the drops in average occupancy that we see in the aggregate data between 2008–09 in Exhibit 4 must be due to other factors (we control for) rather than the financial crisis.

Room rates. September 11's impact on real prices (see Exhibit 8, next page) shows that luxury and upscale hotels were once again most negatively affected. Unlike occupancy levels, however, the negative impact was greatest for luxury hotels in December 2001 and greatest for upscale hotels in November 2001. In these months, the attacks contributed to a drop in real ADR on average of $10.60 for luxury hotels and $5.20 for upscale properties. Midscale, economy, and independent hotels saw much smaller effects (up to $1.50), but in percentage terms that can be a substantial percentage reduction in ADR. For example, the cost of terrorism on luxury hotels in October 2001 was around $3.00 per room (contributing a 2.4-percent drop in rate), the impact on real ADR in economy hotels was 79 cents (contributing a 2-percent drop in rate), the impact on upscale hotels was $3.38 (contributing a 3.9-percent drop in rate), and the impact on midscale hotels without food and beverage was 83 cents (contributing a 1.3 percent drop in rate). By the start of 2002 the negative impact of terrorism remained only for economy hotels, while other segments already experienced improvements in real ADR.

The financial crisis had a shorter and less negative impact on lodging prices in real terms than did the terrorist attacks. On average, rates were least affected for hotels in the midscale without food and beverage segment. Price drops in luxury hotels (up to $1.80) and upscale hotels (up to $0.80) again represent the worst real price drops among branded hotels attributable to financial crisis. Independent hotels also experienced similar decline (about $0.90) when the financial crisis was thought to have started in September 2008. However, by January 2009 no hotel segment experienced reductions in real ADR attributable to the financial crisis, although numerous other factors undoubtedly drove down real ADRs.

The results of RevPAR analysis show a similar pattern to those found for occupancy and real ADR (Exhibit 9, page 16). Though luxury hotels again experienced the worst hit (a drop of $25.00, almost a 30-percent decline), the terrorist attacks had an immediate, large, negative, and significant impact on real RevPAR for all hotels in the industry. That said, the industry rebounded relatively quickly.

With RevPAR we again see that the effect of the financial crisis worsened over time. An odd finding with regard to midscale hotels: those without food and beverage were more

Exhibit 8

Effects of environmental shocks on U.S. hotel average daily room rates by segment

Sample ADR mean	Luxury ($126.91)	Upscale ($85.63)	Midscale w/ F&B ($53.90)	Midscale w/o F&B ($63.64)	Economy ($39.63)	Independents ($36.87)
Impact of Environmental Shocks						
Terrorist Attack—September 11, 2001	-7.768*** [0.466]	-3.945*** [0.213]	-1.021*** [0.110]	-0.838*** [0.072]	-0.257*** [0.068]	-1.441*** [0.211]
1 month after (Oct. 2001)	-3.070*** [0.647]	-3.376*** [0.227]	-0.812*** [0.121]	-0.821*** [0.083]	-0.794*** [0.071]	-0.999*** [0.224]
2 months after (Nov. 2001)	-7.055*** [0.526]	-5.432*** [0.228]	-1.009*** [0.124]	-1.190*** [0.079]	-0.651*** [0.071]	-0.807*** [0.272]
3 months after (Dec. 2001)	-10.598*** [0.564]	-5.221*** [0.281]	-1.108*** [0.136]	-1.097*** [0.084]	-0.776*** [0.074]	-1.537*** [0.294]
4 months after (Jan. 2002)	3.109*** [0.426]	0.843*** [0.200]	0.330*** [0.110]	0.357*** [0.077]	-0.248*** [0.051]	0.771*** [0.204]
Financial Crisis—September 2008	-0.046 [0.428]	0.141 [0.161]	-0.235** [0.116]	0.017 [0.066]	-0.418*** [0.055]	-0.904*** [0.187]
1 month after (Oct. 2008)	-1.438*** [0.417]	-0.793*** [0.147]	0.277** [0.113]	0.267*** [0.061]	0.169*** [0.058]	-0.027 [0.184]
2 months after (Nov. 2008)	-1.827*** [0.392]	-0.745*** [0.151]	0.800*** [0.135]	0.853*** [0.063]	0.756*** [0.057]	-0.086 [0.191]
3 months after (Dec. 2008)	-0.506 [0.633]	-0.178 [0.158]	0.782*** [0.132]	0.958*** [0.070]	0.795*** [0.059]	0.390 [0.249]
4 months after (Jan. 2009)	11.618*** [0.653]	5.891*** [0.187]	2.217*** [0.133]	3.400*** [0.070]	1.981*** [0.056]	2.055*** [0.243]
Constant	-291.484*** [75.667]	-387.704*** [34.242]	-120.247*** [25.732]	-103.805*** [14.096]	-49.413*** [9.816]	-3.826 [79.452]
Observations	193,098	285,952	490,841	843,291	996,653	610,171
R^2 (within)	0.279	0.328	0.652	0.443	0.650	0.475
Number of hotels (fixed effects)	2,308	4,196	6,656	10,682	11,745	9,100

Notes: Besides reported coefficients all the columns include the same variables as specifications shown in Exhibit 5. Robust standard errors adjusted for heteroscedasticity and hotel clusters in brackets. Significant at: *10%, **5%, ***1%. #ADR is deflated to express the monetary values in January 2000. Since some hotels change segments over time the sum of hotels across segments is larger than 34,695 hotels in aggregate sample.

negatively affected by the financial crisis than were mid-scale hotels with food and beverage, which is the opposite outcome after the terrorist attacks. Overall higher-end hotels were more susceptible to these events, but they also made strong rebounds after four months.

Conclusion

The results of our study, based on three million observations of monthly data for 34,695 hotels over ten years (2000-09), show that the hotel industry experienced a more intense and immediate negative impact on occupancy, rate, and RevPAR in real dollars after the terrorist attacks in 2001 than occurred during the more recent financial crisis of 2008. Our results showed a pattern in the duration of impact that suggests the worst effects were immediate in the case of terrorist attack on 9/11, while the effects due to the financial crisis worsened for two months after the fall of Lehman Brothers.

It is not surprising that these two environmental events would affect hotel performance in distinctly different ways. In keeping with the argument by Drakos and Kutan, the terrorism attack on September 11, 2001, showed a sizable

Exhibit 9

Effects of environmental shocks on U.S. hotel RevPAR by segment

RevPAR sample mean	Luxury $87.30	Upscale $59.40	Midscale w/ F&B $31.60	Midscale w/o F&B $40.70	Economy $21.90	Independents $22.80
Impact of Environmental Shocks						
Terrorist Attack—September 11, 2001	-25.396*** [0.665]	-11.757*** [0.295]	-4.480*** [0.146]	-3.754*** [0.099]	-1.498*** [0.072]	-4.602*** [0.253]
1 month after (Oct. 2001)	-18.058*** [0.644]	-9.023*** [0.305]	-4.016*** [0.155]	-3.074*** [0.102]	-1.791*** [0.076]	-3.931*** [0.246]
2 months after (Nov. 2001)	-13.615*** [0.549]	-7.793*** [0.274]	-2.821*** [0.145]	-2.168*** [0.099]	-1.447*** [0.076]	-3.003*** [0.256]
3 months after (Dec. 2001)	-13.303*** [0.578]	-6.120*** [0.272]	-2.826*** [0.154]	-1.817*** [0.101]	-1.829*** [0.079]	-3.166*** [0.261]
4 months after (Jan. 2002)	2.949*** [0.453]	1.676*** [0.225]	0.479*** [0.119]	0.526*** [0.081]	-0.448*** [0.053]	0.929*** [0.184]
Financial Crisis—September 2008	-3.786*** [0.461]	-1.292*** [0.197]	-1.313*** [0.137]	-1.363*** [0.087]	-0.864*** [0.059]	-1.829*** [0.201]
1 month after (Oct. 2008)	-6.761*** [0.480]	-2.542*** [0.199]	-1.340*** [0.139]	-1.480*** [0.090]	-0.599*** [0.064]	-1.785*** [0.188]
2 months after (Nov. 2008)	-12.084*** [0.467]	-5.714*** [0.196]	-2.736*** [0.146]	-3.390*** [0.089]	-0.705*** [0.063]	-2.846*** [0.216]
3 months after (Dec. 2008)	-9.640*** [0.503]	-4.324*** [0.192]	-2.340*** [0.149]	-2.686*** [0.089]	-0.346*** [0.063]	-2.376*** [0.230]
4 months after (Jan. 2009)	5.610*** [0.499]	2.943*** [0.203]	2.928*** [0.140]	3.555*** [0.086]	2.754*** [0.058]	1.824*** [0.195]
Constant	-299.090*** [76.234]	-280.141*** [40.531]	-129.636*** [28.144]	-55.060*** [15.695]	-33.489*** [9.608]	25.843 [77.791]
Observations	194,698	289,420	495,956	852,512	1,006,229	615,547
R^2 (within)	0.216	0.312	0.381	0.342	0.370	0.256
Number of hotels (fixed effects)	2,309	4,196	6,660	10,686	11,745	9,102

Notes: Besides reported coefficients all the columns include the same variables as specifications shown in Exhibit 5. Robust standard errors adjusted for heteroscedasticity and hotel clusters in brackets. Significant at: *10%, **5%, ***1%. #RevPAR is deflated to express the monetary values in January 2000. Since some hotels change segments over time the sum of hotels across segments is larger than 34,695 hotels in aggregate sample.

and immediate negative impact on hotel performance, while the effects of the economic crisis of September 2008 accrued more gradually.[11] In contrast to the shocking terrorist attack, the financial crisis was not a one-time discrete event and the triggers of the crisis were complex and multi-dimensional. More to the point, our analysis showed a relatively short duration of impact from both of these events, with the industry rebounding within about four months each time. That finding is intentionally isolated, however, and we know that the financial crisis had ripple effects that continued to bedevil the hotel industry (see Exhibit 10, next page). Although the direct effects of the economic crisis abated, occupancy rates continued to fall and remained low throughout 2009 and early 2010. These data, while not controlling for the variety of factors held constant in this study, suggest that in the end the financial crisis, when combined with other economic factors, had a more profound long-term effect on the industry than did the terrorist attacks. We also found that the effect was more substantial and negative for occupancy rates and consequently for RevPAR than for room prices (both in real dollars). In particular, the financial crisis by itself appears to have had a modest impact on price with a positive

[11] K. Drakos and A. Kutan, "Regional Effects of Terrorism on Tourism," *Journal of Conflict Resolution*, Vol. 47, No. 6 (2003), pp. 621-641.

Exhibit 10

Seasonally adjusted occupancy rates, U.S. hotels

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
January	64.6	63.2	61.6	62.9	58.6	58.7	60.9	63.0	65.3	64.0	62.3	55.2	54.9
February	63.7	63.4	63.6	62.8	60.0	59.1	60.7	62.4	63.8	62.7	62.0	55.5	56.0
March	62.2	62.9	64.1	63.0	59.4	57.9	61.5	62.7	64.4	64.3	61.0	53.8	56.9
April	63.5	63.1	63.2	60.7	60.3	57.5	61.2	63.5	63.5	62.6	61.8	54.8	57.3
May	63.7	62.7	64.7	61.2	59.9	59.4	60.9	62.0	63.3	63.5	61.5	54.2	57.9
June	63.5	62.3	64.2	61.5	59.7	59.2	61.1	62.8	63.2	63.8	60.5	54.4	58.1
July	63.4	63.6	62.9	59.7	59.3	60.7	62.2	63.3	62.4	61.9	60.1	55.6	59.4
August	63.5	62.9	63.4	61.3	60.2	61.6	60.5	61.8	61.7	62.9	60.9	54.8	58.3
September	64.8	64.4	65.1	54.6	57.4	58.4	62.6	65.0	64.0	63.4	59.0	55.2	58.3
October	64.4	63.7	63.3	56.4	58.9	60.4	62.8	63.2	62.7	63.4	59.2	55.4	58.6
November	62.9	63.7	63.9	58.2	58.8	60.1	61.8	65.6	64.3	63.4	56.6	54.0	58.44
December	63.0	60.5	61.7	58.0	59.0	60.8	62.8	65.4	64.3	62.3	57.1	55.9	N/A

Source: Smith Travel Research, 2010

and quick rebound. Given our comparisons of variations in ADR and RevPAR between real and nominal dollars, such a result is logical. As we already observed when looking at the patterns of aggregate data, seasonality and inflation seem to play a much greater role in price variation than the uncertain external events explored in this study.

Our data also show the diversity in the hotel industry. Hotels in the luxury segment are the most susceptible to environmental jolts, but the economy segment is the slowest to rebound from terrorism. This is most likely due to the fact that the economy segment is more dependent on leisure travelers and tourists who avoided air travel after 9/11 than higher-end segments which rely more on business travelers.

We should note that our data did not examine the specific effect of these two situations on cities such as New York, which was ground zero for both. It is likely that cities far from Wall Street and ground zero may have seen modest alterations to hotel performance during the same time period. Focusing an analysis of this type on specific geographic locations represents a fruitful venue for future research. This study also limits its exploration of the duration of effects to the months immediately following these events. Again, as the occupancy data suggest, it is quite possible that a financial crisis has persistent impact when compared to terrorist events.

One of the contributions of our study for the investment community and hotel operators is that it offers a more comprehensive empirical analysis of the impact of terrorism and the financial crisis on overall rate behavior and individual hotel performance. The media's assertions of extensive ill effects on the travel and tourism industry may have distorted public perception of the intensity and duration of the negative effects of these events. Since many media outlets have headquarters in New York, it's possible that their view was conditioned by what they saw in their vicinity. In addition, the effects of these events undoubtedly commingled with those attributable to other market factors, including unemployment, inflation, and changing consumer preferences, to shape and amplify perceptions of the sustained influence of terrorism and the financial crisis on hotel performance. Our results underscore the importance of controlling for factors that appear to contribute to observed variations in price and performance outcomes. Unlike some studies that presume the industry is susceptible to major disruption,[12] our study suggests a significant but modest and relatively short-term impact from these external jolts. With such a large sample of hotels and rich variation in data over time and markets as in our longitudinal study, first steps have been made to produce a relevant literature that outlines the linkage between external events and hotel performance. ■

[12] For example, see: C. Pforr and P. Hosie, "Crisis Management in Tourism: Preparing for Recovery," *Journal of Travel and Tourism Marketing*, Vol. 23, No. 2/3/4 (2007), pp. 249-264.

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