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ABSTRACT

In this paper, we use asset betas and equity betas over the period January 2000 through December 2015 to investigate the operating and financial risk of hotel industry REITs and C-Corps. We conclude that, on average over our sample period, the operating risk of C-Corps exceeds that of REITs. One interpretation of this result is that management contracts between REITs and C-Corps allocate more operating risk to C-Corps than to REITs. We also find that, on average, during our sample period, the equity betas of C-Corps exceed those of REITs. However, the difference between the average equity risk of the two sectors is much smaller than the sectors' difference in operating risk. Because equity betas capture both operating and financial risk, these results imply that REITs have significantly less operating risk than C-Corps and offset their lower business risk with higher financial leverage. During the global financial crisis, operating risk increases in both hotel industry subsectors, and the amount by which C-Corp asset betas exceed REIT asset betas is roughly proportionate to that observed in noncrisis periods. During the financial crisis, however, REITs experienced a greater increase in financial leverage than did C-Corps, with the result being that the normal relation reverses, i.e., during the global financial crisis, REIT average equity betas significantly exceeded the average equity betas of C-Corps.

Key words: Hotel REITs, Hotel C-Corps, Systematic Risk, Asset Risk

1.0 Introduction

Our paper provides empirical evidence on the operating risk and financial risk of hotel-industry REITs and C-Corps before, during, and after the financial crisis. Our study is motivated by the fact that policy analysts disagree about the allocation of operating risk in the hotel industry. Eyster and deRoos (2009) argue that REITs bear a higher level of hotel operating risk than C-Corps because of the inherent risk in owning property as well as the fact that C-Corps have greater bargaining power than REITs in setting the terms of management contracts. In contrast, Latter and O'Brien (2007) imply that the total return to REITs and C-Corps will be maximized if management contracts transfer operating risk from REITs to C-Corps, thereby allowing REITs to better capitalize on their comparative advantage in bearing financial risk.

Our study is also motivated by a desire to better understand the impact of the global financial crisis of 2007–2010 on the operating and financial risk of hotel REITs and hotel C-Corps. The financial crisis revealed general problems with the bifurcation of real estate and operations, i.e., the Opco/Propco structure. Operating companies in industry segments such as healthcare and food and beverage experienced severe financial distress, the magnitude of which was not experienced by hotel C-Corps. Yet, the global financial crisis of 2007–2010 undoubtedly resulted in an increase in hotel industry operating risk and financial risk, implying that an examination of changes in the relative amounts of operating and financial risk borne by REITs and C-Corps through time is warranted.

Prior research on risk in the hotel industry examines CAPM equity betas or equity betas derived from the Fama-French (1993) three-factor model (see,

e.g., Kim & Jang, 2012; Choudry, 2005; Philippas, Economou, Babalos, & Kostakis, 2013). Equity betas capture a stock's co-movement with market returns and reflect both a firm's operating risk, which varies with fundamentals such as the firm's operating leverage, sales volatility, and competitive environment, and its financial risk, which varies with interest rates and the amount of debt in the firm's capital structure (Ross, Westerfield, Jaffe, & Jordan, 2019). Because equity betas capture both operating and financial risk, it is not possible to draw inferences about the allocation of operating risk from an analysis that focuses solely on equity betas. Nor is it possible to draw inferences about changing financial risk from a measure that aggregates the two types of risk. To get around this problem, we analyze both equity and asset betas. Asset betas, which are the result of adjusting CAPM equity betas for financial leverage, are a pure measure of operating risk. By examining patterns in both equity and asset betas, we are able to draw inferences about both types of risk.

Accordingly, we conduct a longitudinal analysis of the equity betas and asset betas of publicly traded hotel Real Estate Investment Trusts (REITs) and hotel C-Corps. Our sample consists of 18 REITS and 13 C-Corps over the period 2000–2015. We analyze CAPM equity betas as well as CAPM asset betas, which are the betas that result when CAPM equity betas are adjusted for financial risk. We also conduct sensitivity analysis that examines whether our inferences about equity betas hold when the Fama-French (1993) three-factor model is used to calculate equity betas.

We find that over our entire sample period, the average C-Corp equity beta, 1.116, exceeds the average REIT equity beta, 1.021. In addition, the average asset beta of a C-Corp, 0.823, significantly exceeds that of a REIT, 0.468. Since asset betas measure operating risk, we conclude that the operating risk borne by C-Corps significantly exceeds that of REITs. In contrast, the difference between C-Corp and REIT equity betas is much smaller, consistent with REITs having greater financial leverage than C-Corps.

We also present evidence about changes in risk during the financial crisis. In contrast to the results for the entire sample period, the average C-Corp equity beta during the financial crisis, 1.540, is significantly less than the average REIT equity beta, 1.856. However, the normal relation between asset betas of C-Corps and REITs holds during the financial crisis, in that the average C-Corp asset beta, 0.912, exceeds the average REIT asset beta, 0.549. Thus, C-Corps continued to bear greater operating risk than REITs during the financial crisis. The fact that the average REIT equity beta during the financial crisis exceeded the average C-Corp equity beta, but the average REIT asset beta during the financial crisis is less than the average C-Corp asset beta, implies that during the financial crisis, there was a proportionately larger increase in the financial risk of REITs than of C-Corps. As a result, the normal relation between equity betas of REITs and C-Corps is reversed. We also examine the sensitivity of our CAPM equity beta results to use of the Fama-French (1993) three-factor model. Our inferences about C-Corp and REIT sensitivity to market risk are not altered. We do not examine asset betas because there is no three-factor analog to CAPM asset betas.

Our study makes several contributions to the literature. Most importantly, we are the first to empirically examine asset betas of REITs and C-Corps and are thus able to draw inferences about the allocation of operating risk in the hotel industry. We find that the average asset betas of the C-Corps in our sample exceed those of our sample REITs and that the magnitude of this difference in operating risk between the two hotel subsectors is relatively constant through time. From this evidence, we infer that management contracts between REITs and C-Corps are structured such that relatively more of the industry's operating risk is borne by C-Corps. Evidence on the average allocation of operating risk is of interest to hotel managers and others involved in the negotiation of management contracts.

Second, our evidence shows that over our 2000–2015 sample period, the average equity betas of C-Corps exceed those of REITs. This implies that the higher financial risk of REITs (i.e., the average REIT has higher financial leverage than the average C-Corp) does not fully offset their lower business risk. Here, our conclusion contrasts with that of Kim and Jang (2012), whose examination of the equity betas of REITs and C-Corps concludes that there is no difference in the average equity risk of the hotel industry subsectors. The Kim and Jang study predates ours by six years. Thus, we have the advantage of a longer time period that is less influenced by the global financial crisis.

Third, our examination of equity betas during the financial crisis enhances our understanding of the risk borne by REIT investors. REITs allow investors to diversify into real estate without illiquid investments in real property. REITs are often argued to protect investors during stock market downturns (Simon & Ng, 2009). Evidence that during the financial crisis, proportionate and absolute increases in the equity betas of hotel REITs exceeded those of hotel C-Corps suggests that in contrast to the industry overall, hotel REITs do not provide such protection when compared with investments in hotel C-Corps.

Finally, our evidence provides insight into the likely impact of future financial crises on the hotel industry. As Reinhart and Rogoff (2008) state: "While each financial crisis is no doubt distinct, they also share striking similarities in the run-up of asset prices, in debt accumulation, in growth patterns, and in current account deficits." Financial crises such as we saw in 2007–2010 have occurred in the past and are likely to occur again in the future. Thus, our paper provides investors with a likely roadmap for the next financial crisis.

The remainder of the paper proceeds as follows. Section 2 discusses financial risk concepts used in our subsequent analysis. Section 3 develops our hypotheses. Section 4 explains our method, and Section 5 presents our results. We offer concluding remarks in Section 6.

2.0 Financial risk concepts

Finance theory views risk from the perspective of a well-diversified investor, so defines relevant risk as the firm's exposure to market risk. This risk is referred to as the firm's equity beta and is captured by the degree to which the firm's returns co-vary with the returns on the market. Specifically, a firm's equity beta is the slope coefficient from a regression of the firm's return on the market return:

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it} \qquad (1)$$

where:

R_{it} is the return for the ith hotel firm on day t,
α_i is the intercept for the ith hotel firm,
β_i is the slope coefficient for the ith hotel firm, i.e., firm i's equity beta,

R_{mt} is the return on an equal-weighted market portfolio on day t, and
e_{it} is the error term with mean zero.

A firm's exposure to market risk, in turn, is determined by the firm's operating risk and the firm's financial risk. The higher either of these two risks, the higher will be the firm's exposure to market risk (Ross et al., 2019, p. 405–407). Operating risk reflects a wide variety of factors that include but are not limited to: the volatility of the firm's sales, the firm's operating leverage (i.e., the degree of fixed costs in the firm's cost structure), the overall economic climate in the markets in which the firm operates, and the political and regulatory environment facing the firm and its industry. For example, the more a company's sales vary with the business cycle (due to, e.g., the capital-intensity of the firm's industry or the discretionary purchase nature of the firm's products), the higher will be its operating risk.

Financial risk refers to the amount of debt in the firm's capital structure and the firm's cost of debt. Other things equal, the higher the firm's financial leverage, the higher will be the firm's market risk. Intuitively, relative to an equity financed firm, firms with debt financing will report higher income during economic expansions and lower income during economic downturns. In other words, required debt payments increase the variance in net income because debt payments are fixed, i.e., do not vary with the firm's revenue and operating profit.

A firm's equity beta can be adjusted for the firm's financial leverage to yield an estimate of the beta the firm would have if it had no debt. These unlevered betas reflect only the firm's operating risk and are referred to as asset betas. By definition, a firm's asset beta is the weighted sum of its equity beta and its debt beta, implying the following general equation for calculation of an asset beta:

$$\beta_{\text{asset, i}} = (E/(E + D))\, \beta_{\text{equity, i}} + (D/(E + D))\, \beta_{\text{debt, i}} \quad (2)$$

where:

$\beta_{\text{asset, i}}$ is the weighted average co-movement of firm i's debt and equity securities with the market,
$\beta_{\text{equity, i}}$ is the co-movement of firm i's common equity with the market,

$\beta_{\text{debt, i}}$ is the co-movement of firm i's debt with the market,

D   is the market value of firm i's long-term debt, and

E   is the market value of firm i's common stock.

In summary, finance professionals use the co-movement of a firm's stock returns with market returns to measure firm risk that is relevant to well-diversified investors. This risk is measured by the firm's equity beta. A firm's equity beta is determined by the riskiness of both the firm's operations and the firm's financing. In contrast, a firm's asset beta is determined solely by the firm's operating risk.

3.0 Hypothesis development

In this section, we develop two hypotheses. The first hypothesis explores the relative operating risk of REITs and C-Corps, while the second hypothesis examines how the operating risk of REITs and C-Corps changes during the financial crisis. Our hypotheses are preceded by a literature review.

3.1 Literature review

Several prior studies examine market (i.e., equity beta) risk and returns in the REIT industry. The paper most relevant to our study is Kim and Jang (2012), who examine the risk-return characteristics and performance of hotel REITs and C-Corps. Their focus is on an analysis of the two groups of firms from the perspective of an investor constructing a well-diversified portfolio. Using both the CAPM and Fama-French (1993) three-factor model, the authors conclude that there is no significant difference in the equity risk-return profile of the two groups of firms and that the performance of both groups is similar to that of the overall market.

Research prior to Kim and Jang (2012) focuses on the REIT industry as a whole, with the goal of understanding whether the risk profile of a REIT investment parallels that of a private real estate investment. Gilberto (1990), Gyourko and Keim (1992), and Pagliari, Scherer, and Monopoli (2005) present evidence consistent with the argument that the return on a REIT investment should be similar to the return on private real estate because a divergence in the returns on the two investments implies an arbitrage opportunity. In contrast, others argue that there are significant differences in the returns between the two groups because REIT values are determined not only by the value of the underlying real estate but also by tax benefits and management contracts with operating companies. Consistent with both arguments, empirical evidence suggests REITs should be viewed as hybrid securities (Anderson, Clayton, Mackinnon, & Sharma, 2005; Ling & Naranjo, 1999). Finally, Kim and Jang (2012, p. 597) conclude their review of the literature by stating that "the relative importance of real estate and stock market factors in explaining REIT returns seems to vary over time, while the direction of the change is mixed."

Our study contributes to the prior literature in two respects. First, consistent with a focus on returns to equity investors in REITs, the prior literature examines market risk measures that reflect an aggregation of operating and financial risk. In contrast, our focus is on understanding risk from the perspective of a party to a management contract. Accordingly, we examine both equity and asset betas, which allows us to test hypotheses about the relative allocation of operating and financial risk between hotel REITs and hotel C-Corps. Second, the prior literature documents changes in risk over time. Our sample period includes the 2010s, a time period not examined by prior research.

3.2 Hypotheses about average asset and equity betas of REITs and C-Corps

The hotel industry includes REITs, Taxable REIT Subsidiaries (TRSs), C-Corps, and franchise companies. REITs are pass-through entities that avoid federal taxation at the corporate level if at least 90% of earnings are paid out in dividends. Because of their tax-advantaged status, REITs typically own hotel properties that they rent to their wholly-owned TRSs. The creation of a TRS caps the parent REIT's liability, increases its borrowing capacity, and reduces its cost of funds (Latter & O'Brien, 2007). The TRS pays a fixed fee to the REIT and signs a contract with a management company, which is typically a C-Corp or a franchise company. In other words, a TRS is a swap machine that converts

variable hotel revenues and costs into a fixed rental stream for the parent REIT.

Jensen and Meckling (1976) describe the firm as a nexus of contracts, and Scholes et al. (2014) point out that business contracts will be structured to maximize the joint return to all parties to the contract. One of the most important contracts in the hotel industry is the management contract between the REIT (through its TRS) and the C-Corp or franchise company. Because management contracts have the potential to shift risk and return between the parties to the contract, the profitability of a REIT is not solely dependent on the quality of the assets it owns, and the profitability of a C-Corp is not solely dependent on its operating efficiency. The profitability of both entities is also dependent on the terms of the management contract.

Eyster and deRoos (2009) discuss management contracts between owners (e.g., REITs) and management companies (e.g., C-Corps) in the hotel industry. Indicative of contract complexity, the two contract examples they provide are 44 pages and 75 pages long, respectively. Eyster and deRoos argue that the majority of hotel operating risk is born by the property owner. However, they state: "It should be noted that risks are shared according to the relative bargaining strengths of the two parties and each party's ability to negotiate effectively: risks can therefore be redistributed during contract negotiations" (p. 10). Additionally, they argue that both parties seek risk minimization when they negotiate (p. 173). They further note that since the late 1990s and into the 2000s, "operations companies have had more bargaining power in contract negotiations than have property companies" (p. 38).

In summary, Eyster and deRoos (2009) point out that the inherent operating risk of REITs exceeds that of C-Corps and that C-Corps have bargaining power relative to REITs. In contrast, Latter and O'Brien (2007) imply that the total return to a management contract will be maximized if some REIT operating risk is transferred to C-Corps, thereby allowing REITs to capitalize on their comparative advantage in accessing debt markets. Thus, policy analysts disagree about the relative magnitude of the operating risk borne by REITs and C-Corps. Accordingly, we offer the following two-sided prediction (stated in null form):

Hypothesis 1a: Over the sample period, the average asset beta of REITs equals the average asset beta of C-Corps.

Equity risk includes both operating risk and financial risk. Kim and Jang (2012) examine the relative equity risk of REITs and C-Corps over the period 2000–2009 and conclude that there is no difference in the risk borne by investors in the two hotel industry subsectors. However, the results of Kim and Jang may be confounded by the fact that the global financial crisis, when many hotel firms were near or in financial distress, spans approximately one-half of their sample period. For completeness, we also test the following two-sided hypothesis (stated in null form) examined by Kim and Jang (2012):

Hypothesis 1b: Over the sample period, the average equity beta of REITs equals the average equity beta of C-Corps.

3.3 Hypotheses about average asset and equity betas of REITs and C-Corps during the financial crisis

The global financial crisis is considered the worst financial crisis since the Great Depression (Temin, 2010). It began with the collapse of the subprime mortgage market in the United States and developed into an international banking crisis with the September 15, 2008, collapse of Lehman Brothers (Williams, 2010). Despite various regulatory reforms and large government bail-outs of financial institutions in the United States, the crisis was nonetheless followed by a global economic downturn referred to as the Great Recession. We refer to the financial crisis and the ensuing recession as the global financial crisis.

During the global financial crisis, the operating risk of firms in the hotel industry significantly increased as revenue from lodging, food service, and events significantly declined. As Pizam (2009) explains, the decline is attributable not only to fewer retail and conference customers but also to a significant decline in average expenditures per customer. Even affluent customers reduced expenditures by purchasing lower-priced versions of the products and services that they had typically purchased

before the crisis. The impact of this increase in operating risk is an increase in the asset betas of both REITs and C-Corps. The relative impact on these two industry subsectors will depend on the terms of the management contract and whether those terms are renegotiated in response to the crisis. Thus, the relative magnitude of the business risk borne by REITs and C-Corps during the financial crisis is also an open question. Accordingly, we again offer a two-sided prediction (stated in null form):

> Hypothesis 2a: During the global financial crisis, the average asset beta of REITs equals the average asset beta of C-Corps.

Associated with an increase in business risk during the global financial crisis is a decline in commercial property values. Figure 1 displays commercial property returns over the period 2000–2015, as measured by the annual percent change in Green Street's Commercial Property Price Index (Green Street Advisors, 2018). The annual percent change declines in 2007 and is negative in 2008 and 2009. Recovery started occurring in 2010. A decline in asset values implies a decline in equity values. Thus, financial risk also increased during the Global Financial Crisis because declines in the market value of hotel firms' assets imply declines in the market value of equity and significant increases in market-based debt-to-equity or debt-to-assets ratios.

Figure 2 displays the average beginning of year value of long-term debt relative to the market value of common stock for publicly traded REITs and C-Corps in the United States, as derived from COMPUSTAT data. For an ideal measure of financial leverage, both the equity value and the debt value should be market values. However, we use the book value of debt because under U.S. GAAP, most debt securities are valued at fair value, which approximates market value. For equity, a market value is easily obtainable as the beginning of year price multiplied by the number of shares outstanding. Figure 2 indicates that the global financial crisis had a larger impact on the financial leverage of REITs than on the financial leverage of C-Corps. These leverage effects imply that in response to the financial crisis, there will be a larger increase in the equity betas of REITs than of C-Corps. Whether equity betas of REITs will exceed those of C-Corps also depends on the relative magnitude of equity risk in the two sub-sectors prior to the crisis. Thus, we again offer a two-sided prediction (stated in null form):

> Hypothesis 2b: During the global financial crisis, the average equity beta of REITs equals the average equity beta of C-Corps.

4.0 Sample and study design

Our sample consists of 31 U.S.-based publicly traded C-Corps and REITs in SIC code 7011 for which at least four years of Center for Research in Security Prices (CRSP) stock price data is available during the sample period 2000–2015. CRSP coverage includes firms that are traded on the NYSE, AMEX, or NASDAQ. A list of sample firms is provided in Table 1. Panel A of the table provides firm names and data availability and Panel B summarizes the
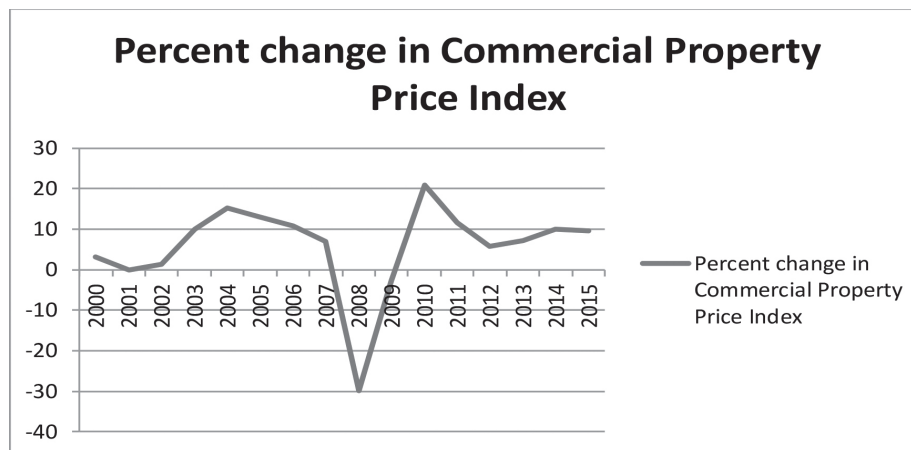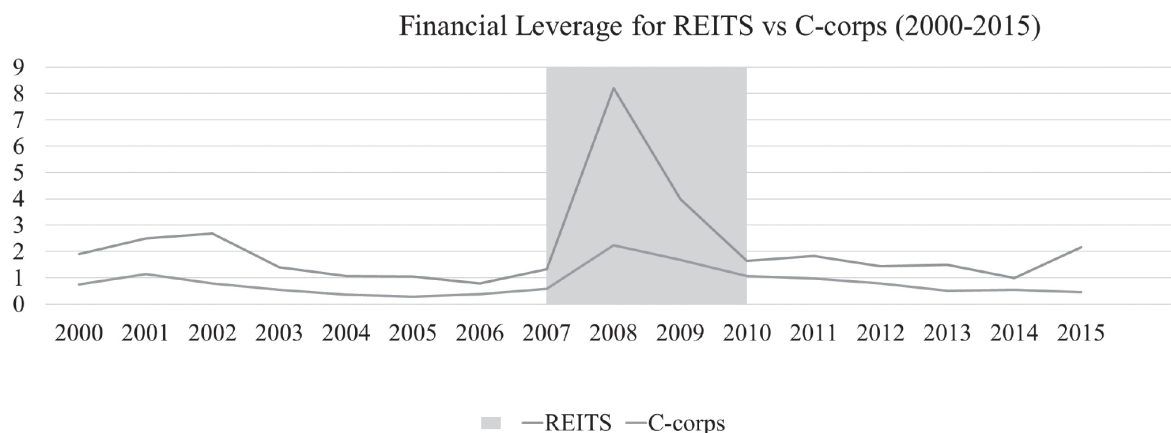

Figure 1. Year to year percent change in Green Street's Commercial Property Price Index.

Figure 2. Market leverage of REITs versus C-Corps from January 3, 2000 to December 31, 2015.
Note: Financial leverage = book value of long-term debt / market value of equity; book value of debt is used as a proxy for the market value of debt since market values are not available for most firms. Shaded area represents the financial crisis decline and recovery.

number of firms with available data each year. Of the 31 publicly traded hotel firms, 18 are REITs and 13 are C-Corps. An examination of Table 1 Panels A and B reveals that several firms come into and out of the sample during our 16-year sample period. This occurs as firms enter or exit the hotel industry, go private, or conduct an IPO. We include firms even if a full 16 years of data is not available to avoid survivorship bias. In other words, we want conclusions about risk in the hotel industry to reflect the typical firm in the industry, as opposed to only successful firms that survived the entire period.

Table 1. Sample Description

Panel A					
Firms in the sample listed by REIT versus C-Corp and dates for which data is available					
TICKER	Company Name	Class	PermNo	Date In	Date Out
HOST	American Properties, Inc.	REIT	11358	1/1/2000	12/31/2004
MGMG	MGM Grand, Inc.	C-Corp	11891	1/1/2000	12/31/2015
INN	Summit Hotel Properties, Inc.	REIT	12566	1/1/2011	12/31/2015
RLJ	RLJ Lodging Trust	REIT	12756	1/1/2011	12/31/2015
HST	Host Hotels & Resorts, Inc.	REIT	46703	1/1/2000	12/31/2015
MCS	Marcus Corp.	C-Corp	51423	1/1/2006	12/31/2015
MCRI	Monarch Casino & Resort, Inc.	C-Corp	79507	1/1/2000	12/31/2015
FCH	Felcor Lodging Trust, Inc.	REIT	80747	1/1/2000	12/31/2015
CDOR	Condor Hospitality Trust, Inc.	REIT	81087	1/1/2000	12/31/2015
HPT	Hospitality Properties Trust	REIT	81917	1/1/2000	12/31/2015
MHX	Meristar Hospitality Corp.	REIT	83718	1/1/2000	12/31/2015
MTN	Vail Resorts, Inc.	C-Corp	84588	1/1/2003	12/31/2015
GET	Gaylord Entertainment Co. New	REIT	85426	1/1/2000	12/31/2015
CHH	Choice Hotels International, Inc.	C-Corp	85517	1/1/2000	12/31/2015
LQI	La Quinta Properties, Inc.	REIT	85619	1/1/2000	12/31/2004
MAR	Marriott International Inc. New	C-Corp	85913	1/1/2003	12/31/2015
IHR	Interstate Hotels & Resorts, Inc.	C-Corp	86226	1/1/2000	12/31/2008
HT	Hersha Hospitality Trust	REIT	86563	1/1/2000	12/31/2015
AHT	Ashford Hospitality Trust	REIT	89803	1/1/2004	12/31/2015
SHR	Strategic Hotel Capital, Inc.	REIT	90217	1/1/2004	12/31/2014
SHO	Sunstone Hotel Investors, Inc. NE	REIT	90394	1/1/2004	12/31/2015
WOLF	Great Wolf Resorts, Inc.	C-Corp	90491	1/1/2004	12/31/2011
LVS	Las Vegas Sands Corp.	C-Corp	90505	1/1/2004	12/31/2015
SOHO	Sotherly Hotels, Inc.	REIT	90506	1/1/2004	12/31/2015
DRH	Diamondback Hospitality Co.	REIT	90680	1/1/2005	12/31/2015
MHGC	Morgans Hotel Group Co.	C-Corp	91096	1/1/2006	12/31/2015
HOT	Starwood Hotels & Rest Wldwd Inc.	C-Corp	91207	1/1/2000	12/31/2015

(*continued*)

Table 1.   Sample Description *(continued)*

Panel A

Firms in the sample listed by REIT versus C-Corp and dates for which data is available

TICKER	Company Name	Class	PermNo	Date In	Date Out
H	Hyatt Hotels Corp.	C-Corp	93098	1/1/2009	12/31/2015
PEB	Pebblebrook Hotel Trust	REIT	93178	1/1/2010	12/31/2015
CLDT	Chatham Lodging Trust	REIT	93314	1/1/2010	12/31/2015

Note: All REITs are Propcos. The C-Corp, Interstate Hotels and Resorts, is a pure Opco. Choice Hotels International is a franchise company, a type of C-Corp in which the corporation franchises the property and provides some management services. Since Choice Hotels provides some of the management services and expertise but does not own properties it is a specialized type of Opco. The remaining C-Corps listed above manage hotels and to a greater or lesser degree own some hotel properties.

Panel B

Number of firms in the sample listed by REITs, C-Corps, and total by year

Year	REITs	C-Corps	Total
2000–2002	9	5	14
2003	9	7	16
2004	13	9	22
2005	12	9	21
2006–2008	11	11	22
2009	11	12	23
2010	13	12	25
2011	15	12	27
2012–2014	15	11	26
2015	14	11	25

4.1 Definition of the financial crisis

To test our second set of hypotheses about the impact of the global financial crisis on the risk of hotel REITs and hotel C-Corps, we need to identify the time period spanned by the crisis. Any definition will be somewhat arbitrary. We base our definition on a statistical analysis of the monthly Green Street Commercial Real Estate Price Index. A statistical analysis of the monthly commercial price index over the period 2000 to 2015 reveals that the mean percent change (standard deviation) in the index is 0.412% (1.724%). A 90% confidence interval around the mean is +3.2% to −2.42%. Based upon these calculations and a visual appraisal of the data, we define any monthly change of 3% or more, in absolute value, to indicate that we are in either the initial decline or recovery phase of the crisis. This leads to a definition of the crisis as starting in June 2008 and the recovery continuing through April 2010.

4.2 Measurement of equity betas and asset betas

Equity betas change over time with changes in the firm's operating and financial risk. Accordingly, we apply Equation 1 to estimate firm-specific equity betas using rolling windows. We begin on day 1 of our sample period, using day 1 stock returns and returns for the previous 254 trading days to estimate firm i's equity beta on day 1. The process of beta estimation is repeated for firm i on day 2, and so on. The result is a time series of equity betas for each firm, for any day on which that day and the previous 254 days of returns are available.

To compute asset betas, we apply Equation 2, which tells us that a firm's asset beta is the weighted sum of its equity and debt betas. In our study the amount of debt, D, is proxied by the book value of debt at the end of the year closest to, but preceding the first day of, the equity beta estimation period. E is number of common shares outstanding multiplied by the beginning of year price of firm i's common stock in the year closest to, but preceding the first day of, the equity beta estimation period. We assume that the firm's debt does not strongly co-move with the market. If we assume that β_{debt} is zero, then Equation 2 reduces to:

$$\beta_{\text{assets}} = \beta_{\text{equity}} / (1 + D/E) \qquad (3)$$

This equation is appropriate for REITs in our sample because REITs pay no federal taxes. Hence, we use Equation 3 to unlever REIT equity betas.

We take a slightly different approach for C-Corps because C-Corps are taxed by the federal government. If we introduce the idea that debt interest payments are a tax-deductible expense and t_c is the firm's marginal corporate tax rate, then:

$$\beta_{assets} = \beta_{equity} / (1 + (1 - t_c)D/E) \qquad (4)$$

We assume that all C-Corps face the same corporate tax rate of 34%. Using this assumption, we then apply Equation 4 to unlever the equity betas of our sample C-Corps.

To form portfolios, we begin by dividing the sample into two groups consisting of hotel REITs and hotel C-Corps. We compute equal-weighted REIT portfolio equity (asset) betas for each day by averaging the individual firm equity (asset) betas available on that day. Similar computations are made on each day for all of the C-Corps. These average equity and asset betas are then used to test for differences between the two groups over the entire time period and during the global financial crisis.

5.0 Results

This section provides the results of the analysis. Section 5.1 compares the asset betas of REITs with those of C-Corps over the entire sample (Hypothesis 1a) and during the financial crisis (Hypothesis 2a). Section 5.2 compares the equity betas of REITs with those of C-Corps over the entire sample (Hypothesis 1b) and during the financial crisis (Hypothesis 2b).

Section 5.3 presents sensitivity analysis using the Fama-French (1993) three-factor model. Throughout Sections 5.2 and 5.3, we use parametric t-tests and non-parametric Wilcoxon Signed Rank tests to analyze our hypotheses. We discuss the t-stats in the body of the paper. Inferences from the Wilcoxon Signed Rank tests are reported in the tables and are qualitatively similar.

5.1 Asset beta of REITs and C-Corps

Figure 3 plots average daily asset betas for REITs and C-Corps over the period 2000–2015. A visual examination of the figure shows that the average REIT asset beta is less than the average C-Corp asset beta over the entire time period and during the financial crisis. This result is confirmed by the t-tests of hypotheses Hypothesis 1a and Hypothesis 2a provided in Table 2. Specifically, both in crisis and out of crisis the differences are statistically and economically significant. Over the entire time period, the average C-Corp asset beta is 75.8% larger ((0.823−0.468)/0.468) than the average REIT. Although asset betas for both subsectors increase during the financial crisis, the relative magnitudes of the two sectors' operating risk remain similar. During the financial crisis, the average asset beta for C-Corps was 66.1% larger ((0.912−0.549)/0.549) than the average REIT asset beta. The similarity in this relationship in-crisis versus otherwise is striking. If the inherent operating risk of a REIT exceeds that of a C-Corp (Eyster and deRoos, 2009), then
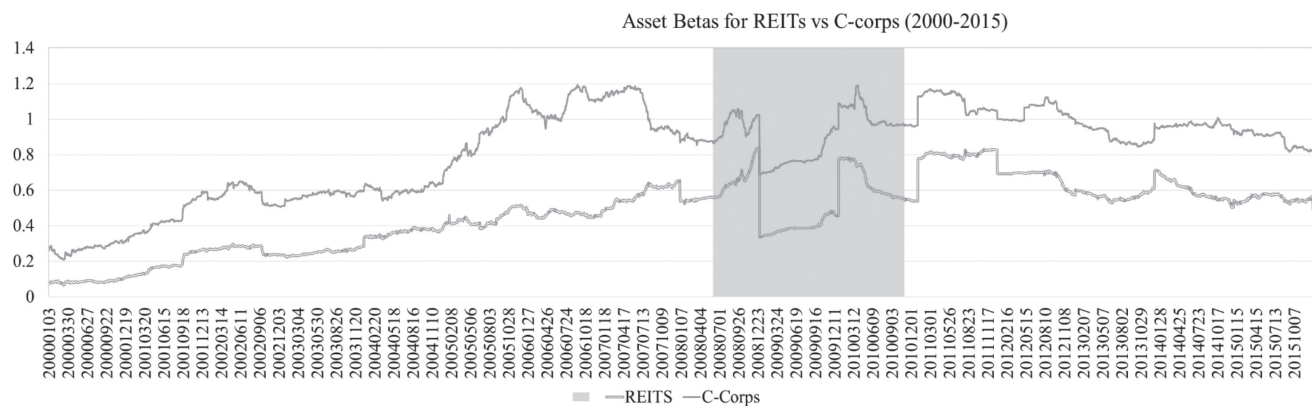
Figure 3. Asset betas for REITs versus C-Corps (2000–2015).
Note: Annual adjustment based on market value of equity and book value of long-term debt as of December 31 of previous year.

Table 2. Asset Betas for REITs vs C-Corps (2000–2015)

t-test: Two-Sample Assuming Unequal Variances				
	1/1/2000 REITs	12/31/2015 C-Corps	6/1/2008 REITs	10/31/2010 C-Corps
Mean	0.468	0.823	0.549	0.912
Variance	0.038	0.064	0.022	0.017
Observations	4,025	4,025	610	610
t-stat	70.325	***	45.378	***
Wilcoxon Signed Rank test	97.641	+++	42.782	+++

*** Significant at the 0.001 level or better, in a two-tailed t-test that assumes unequal variances.
+++ Significant at the 0.001 level or better.
Note: The conclusion that REIT asset beta is much lower than C-Corp asset beta is robust to different assumptions regarding C-Corp tax rates. The above results assume that REITs face a 0% tax rate and C-Corps face a 34% corporate tax rate. If we assume that both REITs and C-Corps face the same, 0%, tax rate results in average C-Corp asset beta of 0.6541, which is still 40% higher than the average asset beta for REITS.

this result implies that management contracts shift operating risk from the REIT to the C-Corp and that this shift occurs in all states of the economy.

5.2 Equity betas of REITs and C-Corps

Figure 4 plots average daily equity betas for REITs and C-Corps over the period 2000–2015. A visual examination of Figure 4 suggests that C-Corp equity betas exceed the equity betas of REITs, with the exception of the global financial crisis, when REIT equity betas exceeded C-Corp equity betas. This analysis is confirmed by the statistical tests in Table 3. A t-test of the null hypothesis that the average equity beta of the two groups is the same (Hypothesis 1b) is rejected. Over the sample period, the average equity beta for C-Corps is 8.5% larger ((1.116−1.021)/1.021) than the average equity beta for REITs. Thus, an equity investment in REITs is less risky than is an equity investment in C-Corps. In contrast, using a shorter time period that is more

heavily influenced by the financial crisis, Kim and Jang (2012) conclude that there is no difference in the market risk of the two subsectors. This difference in the two groups' equity betas is much smaller than is the average difference in the two groups' asset betas. One interpretation of the combined results is that management contracts shift business risk from REITs to C-Corps. REITs then offset their lower business risk with higher financial leverage.

This higher financial leverage negatively impacted REITs during the global financial crisis, due to a proportionately larger decline in equity in response to falling asset prices. As we see in Figure 2, REITs experienced a proportionately larger increase in financial leverage than C-Corps. A t-test of the mean differences in equity betas during the financial crisis (Hypothesis 2b) rejects the null hypothesis that there is no difference in the equity risk of the two subsectors. Average REIT equity betas during the crisis are 20.5% larger ((1.856−1.540)/1.540) than average C-Corp equity betas. Thus, the crisis
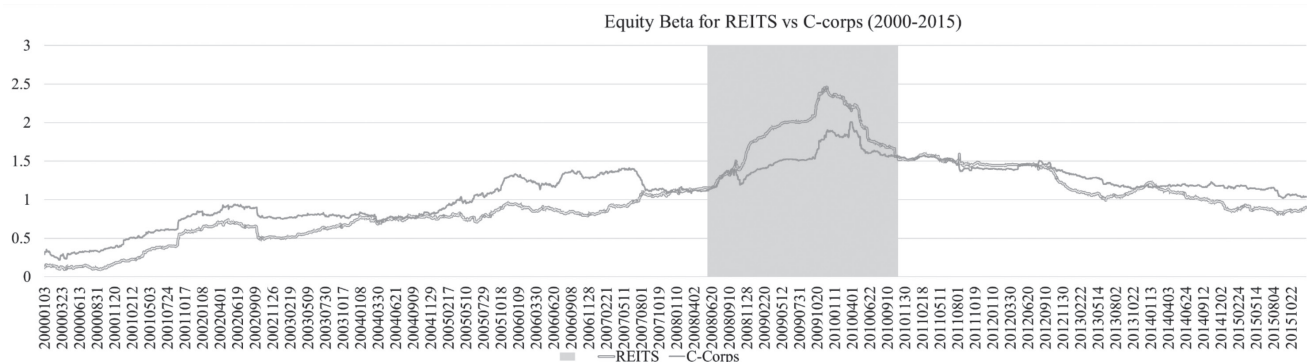
Figure 4. Equity betas for REITs versus C-Corps (2000–2015).
Note: CAPM-based beta calculation, on a daily basis with a 255-day estimation window.

Table 3.   CAPM equity betas for REITs versus C-Corps

	1/1/2000 REITs	12/31/2015 C-Corps	6/1/2008 REITs	10/31/2010 C-Corps
Mean	1.021	1.116	1.856	1.54
Variance	0.258	0.13	0.12	1.54
Observations	4,025	4,025	610	610
t-test	9.696	***	−19.322	***
Wilcoxon Signed Rank test	28.925	+++	−42.782	+++

*** Significant at the 0.001 level or better, in a two-tailed t-test that assumes unequal variances.
+++ Significant at the 0.001 level or better.

resulted in an anomalous period during which an equity investment in a REIT was riskier than an equity investment in a C-Corp.

5.3 Sensitivity analysis

In this section we examine the sensitivity of our equity beta results to use of the Fama-French (1993) three-factor model rather than the CAPM. The three-factor model was developed in response to the fact that small and value companies had persistently higher returns than could be explained by the

CAPM. There is no asset beta analog for the three-factor model, so we do not present formal hypothesis tests.

Results from the three-factor estimation are presented in Table 4. As do Kim and Jang (2012), we find that for both C-Corps and REITs, each of the three factors explains returns. Consistent with the results reported in Table 3, the coefficient on the market factor estimated for C-Corps (REITs) is higher (lower) than the coefficient for REITs (C-Corps) for the complete period (financial crisis period). In addition, the coefficients on the firm size

Table 4.   Fama-French Three-Factor Results

Panel A. FF-3 Beta one results (the market beta)

	1/1/2000 REITs	12/31/2015 C-Corps	6/1/2008 REITs	10/31/2010 C-Corps
Mean	0.931	1.048	−1.477	1.264
Variance	0.133	0.051	0.164	0.024
Observations	4,025		610	610
t-stat	17.257	***	−12.1462	***
Wilcoxon Signed Rank test	102.213	+++	−28.662	+++

Panel B. FF-3 Beta two results (small/big portfolios)

	1/1/2000 REITs	12/31/2015 C-Corps	6/1/2008 REITs	10/31/2010 C-Corps
Mean	0.604	0.581	1.163	1.042
Variance	0.115	0.104	0.073	0.054
Observations	4,025		610	610
t-stat	−3.105	***	−8.385	***
Wilcoxon Signed Rank test	−8.209	+++	−15.016	+++

Panel C. FF-3 Beta three results (high book/low book portfolios)

	1/1/2000 REITs	12/31/2015 C-Corps	6/1/2008 REITs	10/31/2010 C-Corps
Mean	0.472	0.319	0.958	0.699
Variance	0.156	0.13	0.119	0.022
Observations	4,025	4,025	610	610
Hypothesized mean difference	0	0	0	
Df	7984		830	
t-stat	−18.058	***	−16.991	***
Wilcoxon Signed Rank test	−109.893	+++	−37.001	+++

*** Significant at the 0.001 level or better, in a two-tailed t-test that assumes unequal variances.
+++ Significant at the 0.001 level or better.

and book-market factors are larger for REITs than for C-Corps. Inferences about overall model fit are similar to those in Kim and Jang (2012).

6.0 Summary and conclusions

In this paper, we use asset betas and equity betas over the period January 2000 through December 2015 to investigate the asset beta and equity beta risk of hotel industry REITs and C-Corps. We conclude that, over our sample period, the average asset beta of hotel C-Corps exceeds that of hotel REITs implying that C-Corps bear greater operating risk. We also find that, on average over our sample period, the equity betas of C-Corps exceed those of REITs, implying that the combined operating and financial risk of C-Corps exceeds that of REITs. However, the difference between the average equity beta risk of the two sectors is much smaller than is the difference in the operating risk between the two hotel sectors, consistent with REITs having higher financial leverage due to their tax-advantaged position.

We also find that during the global financial crisis, operating risk increases by modest amounts in both hotel industry subsectors, and the amount by which C-Corp asset betas exceed REIT asset betas is roughly proportionate to that observed in non-crisis periods. During the financial crisis, however, REITs experienced a greater increase in financial leverage than did C-Corps, with the result being that the normal relation reverses. I.e., during the global financial crisis, the combined operating and financial risk of REITs, as measured by their equity betas, significantly exceeded the average equity betas of C-Corps.

These results suggest a nuanced view of risk allocation in the hotel industry. On the one hand, for the firms in our sample, management contracts between hotel REITs and hotel C-Corps allocate greater operating risk to C-Corps than to REITs. This is consistent with arguments by analysts such as Latter and O-Brien (2007), who conclude that the total return of all parties to a hotel management contract is maximized if the management contract allocates greater operating risk to C-Corps than to REITs, thereby allowing REITs to make optimal use of their tax-advantaged status through high financial leverage. On the other hand, our results are also consistent with analysis of Eyster and deRoos (2009), who argue that C-Corps have greater bargaining power

than REITs. Their greater bargaining power may explain why hotel C-Corps fared better during the financial crisis than operating companies in other segments of the REIT industry, e.g., food and beverage Opcos and healthcare Opcos.

Of course, an alternative explanation for hotel C-Corps relative strength during the financial crisis is that the source of hotel C-Corps bargaining power—their brands—allowed them to better whether the financial crisis. We leave exploration of the explanation for hotel C-Corps' relative strength during the financial crisis to future research.

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