Published in "International journal of hospitality management", 2020, vol. 89, article 102564, pp. 1-12, which should be cited to refer to this work.
DOI: 10.1016/j.ijhm.2020.102564

What Explains Differing Holding Periods Across Hotel Investments? A Hazard Rate Framework

Abstract

Predictability of how long the current owners will hold a hotel (i.e. the "holding period", HP hereafter) has strategic implications for owners, lenders, and consultants. An arbitrarily chosen HP may lead to valuation errors. We explain the variation in HP based on liquidity needs, owner type, acquisition conditions and timing of hotel renovation. Contrary to popular belief, properties owned by listed companies tend to have longer HPs due to lower liquidity constraints. REITs sell heterogeneous hotels sooner to strengthen their focus whereas REOCs keep such assets longer for diversification benefits. Moreover, we document that higher quality hotels tend to have longer HPs, and that capital expenditure employed in renovating an acquired asset prolongs the HP whereas assets renovated before acquisition experience shorter HPs. Finally, we show how our model can be used in practice to predict the median HP based on a given hotel characteristics, and present a method to adjust the DCF discount rate according to the selected holding period.

Keywords

Holding period ● Hotel ● Sale decision ● REIT ● Hazard models

Introduction

The hotel investment lifecycle starts with an acquisition (or development) of the asset followed by operations, renovations and, often, a disposition. After acquisition (or development) 95% of the budget hotels and 40-60% of other hotels are sold at least once[1]. Hotel disposition (sale) implies a big-ticket transaction. Each transaction has monetary implications for multiple stakeholders: buyers, sellers, lenders and consultants. Nearly $66 billion worth of hotels were sold globally in 2019. During this year, despite witnessing a 5% drop in volume, nearly $36.8 billion worth of hotels were transacted in the US alone[2].

Sellers are faced with various transaction costs (i.e. fees of appraisers, lawyers, and consultants) that range between 2% to 5% of asset price amounting to roughly $0.7 -1.8 billion in 2019. Beside, although asset sale is often the biggest source of return for real estate owners, the returns are sensitive to the estimated timing of sale[3]. The timing of sale impacts capital expenditure budgets and tax estimates (capital gains, depreciation recapture and title transfer or stamp duty, whichever are applicable) among others. The sale of a hotel often also leads to a substantial aberration in cash flow projection for buyers and sellers who must anticipate the event for strategic planning. Sellers, in particular, may need to project the tax and transaction cost implications to their projected cash flows. The estimated revenue[4] for lenders related to hotel sales in 2019 alone was $44 million (in the US). This estimate excludes the prepayment penalties and refinancing costs potentially associated with the sale of a mortgaged asset. Loan underwriters need an estimate of the holding period to sign mortgage contracts commensurate with the anticipated prepayment risk. While an early asset sale may imply a hazard to lenders, they provide a business opportunity for consultants: appraisers, brokers, lawyers, etc. Therefore, being able to predict the holding period of an asset benefits hotel asset managers, in general.

Much has been studied about acquisition and disposition decisions in terms of valuation and investment analysis metrics[5]. However, renovation decisions (i.e. capital expenditure, CAPEX hereafter) and the holding period - despite being critical to generating returns - have received scant scientific attention, especially in the hotel sector. A lack of understanding about

[1] Refer to Table 4. A majority of the hotels in our sample were sold at least once during their lifetime.
[2] See “Q4 2019: U.S. Capital Markets Figures” by CBRE and “Hotel Investment Outlook 2020” by JLL.
[3] See Desai (2017)
[4] Considering an average 60% loan-to-value ratio and 2% closing costs
[5] See Roubi & Litteljohn, 2004; Ganchev, 2007; Chen & Woo Gon Kim, 2009; Fleischer, 2012; Nicolau & Santa-María, 2013; Saló, Garriga, Rigall-I-Torrent, Vila, & Fluvià, 2014; Camilleri, 2015; Das, 2015; Puciato, 2016.

the holding period also leads to valuation errors. In general finance, the Gordon-Growth formula suggests that so long as the asset is sold after the cash flows have stabilized, the valuation is independent of the holding period. The sale price of the asset is estimated by capitalizing the stabilized cash flow projection by a "terminal rate". This terminal rate is a function of the asset's risk profile (cost of capital, in particular) and the stabilized growth rate in the cash flows. However, in real estate markets, the terminal rate (also known as "Going-out capitalization rate") used for valuation is derived from market trends and is often disconnected from the asset's cash flow growth projections. As a result, hotel valuation becomes sensitive to the selection of holding period in valuation exercise. As a matter of convention, it is a common practice to use 5 or 10 years as a hotel's holding period to estimate the discounted cash flow (DCF) value. For valuation to be consistent across holding periods, either the going-out capitalization rate, or the discount rate must be accordingly adjusted. However, the going-out capitalization rate is often erroneously fixed at the outset and reported as a function of current time, independent of the holding period. Clearly, a lack of clarity on HP, in particular, is a source of valuation error. In reality, the implied HP of hotels - except for the extreme boom periods of 2003 to 2007 and the subsequent bust period of 2007 to 2012 - has typically varied between 5 to 18 years averaging around 9-10 years[6]. To ensure that valuation is consistent across the assumed HPs, the discount rate must be accordingly adjusted.

In this paper, we explain the variation in hotel HPs. We show that a hotel's HP is determined not only by its own characteristics, but also by the characteristics of the acquiring company, the timing of capital expenditure and acquisition conditions. The central objective is to first determine a "typical" holding period for the given asset before applying the market-suggested discount rate (Ω) or capitalization rate (γ_{in}) for DCF valuation.

In particular, we study a sample of 6,138 observations between 1990 and 2018 from a portfolio of hotels acquired by real estate investment trusts (REITs[7]) and real estate operating companies (REOCs[8], Hotel operator or "Non-REIT") covering a range of listed and non-listed companies. The analysis of HP is challenged by a fact that several hotels in the sample were unsold until their most recent observation (leading to "censored" observations) and their HP was yet to be observed. Applying OLS models to the holding period is not appropriate due to censoring. Therefore, we employ semi-parametric Cox-proportional Hazard (CPH) models and

[6] We provide a more detailed evidence later in the paper.
[7] E.g. Host Hotels and Resorts
[8] E.g. Hyatt

parametric Accelerated Failure Time (AFT) models to examine the determinants of HP. The CPH semi-parametrically models the "hazard" of an asset sale at a particular investment horizon and, thus, could be construed as the converse of HP.

We find that the average HP of hotels has drastically declined in recent years. More importantly, our CPH models highlight the inadequacy of descriptive statistics, which lead to misleading inferences. Our findings are nuanced and supported by hypotheses that we present later. Contrary to descriptive statistics, our semi-parametric CPH models suggest the longest HP in listed REITs and the shortest in non-listed REITs. We propose our hypotheses rooted in the business model of these entities and their ease of financing. In general, listed firms tend to be associated to longer HPs. As they have wider financing options, new acquisitions can be made without having to sell some of their current holdings. Hotel properties owned by hotel companies have shorter HPs, because REOCs have incentives to sell their existing assets quicker than REITs once they do not provide attractive tax deductions anymore. Interestingly, we find that assets that are renovated before acquisition tend to have shorter HPs whereas assets renovated after acquisition are held longer. We explain this result by the fact that the best positioning of the property is different from the acquirers' preferences when the asset was renovated before acquisition. Assets owned through portfolio acquisitions have a higher hazard of being sold. However, REITs and REOCs (dominated by hotel operators) exhibit significantly different attitudes towards disposing of assets owned via merger and acquisition (M&A) deals. Properties built on leased land tend to have a longer HP due to their lack of attractiveness to prospective buyers. We also present some evidence that older hotels will be sold sooner and larger hotels tend to have longer HPs. An analysis of ownership-based subsamples points towards significantly different strategic approaches towards the HP across REITs, REOCs, listed and non-listed owners.

Contributions

Our study has practical as well as theoretical contributions. The scientific endeavors on HP are scant and conspicuously exclude hotels from analysis[9]. Ours is the first study to provide such a detailed set of determinants of HP. Second, we focus on hotels, a large asset class conspicuously ignored in earlier literature. From a practitioner standpoint, our findings highlight the long-

[9] Besides, simplistic analyses of holding period based on descriptive analysis could be misleading due to censoring of data in such observations. The issue of censoring stems from the fact that several hotels in the sample have not yet been sold - but could be sold in the future - leading to uncertainty regarding their holding period.

ignored issue of differential HP across owner-types, asset characteristics within a property segment (i.e. hotels), the role of CAPEX (i.e. renovation) timing and the nature of acquisition in determining a hotel's HP. Overall, we contribute to the scant literature on the determinants of assets' HP (Collett et al., 2003; Fisher et al., 2004; Barthélémy and Prigent, 2008; Amédée-Manesme, 2015), to the literature focusing on REITs and REOCs active in the hospitality industry (Kim et al., 2002; Tang and Jang, 2008; Kim and Jang, 2012; Kim et al., 2019), and to the literature on the impact of CAPEX on various outcomes (McConnell and Muscarella, 1985; Blose and Shieh, 1997; Vogt, 1997; Ghosh and Petrova, 2017; Ambrose and Steiner; 2019).

After presenting our results, we provide concrete examples of how our findings can be applied by industry practitioners to derive a HP for a specific hotel property. In particular, we offer examples of how to apply this study to estimate an asset-specific holding period and adjust the discount rate for more accurate valuation.

The remainder of the paper is organized as follows: we provide a synthesis of literature based on which we develop our hypotheses. The following section describes the data followed by methodology. In the next section we present and discuss the findings. The last section provides conclusions.

Background and Hypotheses

A large body of literature has investigated the determinants of HP. Finance studies focused on stocks document a positive association of HP with transaction costs (proxied by the bid-ask spread) and volatility of returns (Demsetz, 1968; Tinic, 1972; Hess, 1991; Amihud and Mendelson, 1986; Bhide, 1993; Umlauf; 1993; and Atkins and Dyl, 1997). Investors holding illiquid stocks wait for a longer period to get a large enough return on their investment to cover transaction costs, while they sell quicker if there is high uncertainty surrounding the stock price. Similarly, the HP of a real property is a function of various factors, including market conditions, taxes, transaction costs or investment type (Collett et al., 2003; Fisher et al., 2004; Barthélémy and Prigent, 2008; Amédée-Manesme, 2015).

Collett et al. (2003) investigate the HP of commercial real estate and find that HPs vary by the year of purchase and across property types. For example, small offices have the highest sales rate while shopping centers have the longest HPs. Some properties are subject to entry barriers that limit the number of potential acquirers, and some might represent trophies and are held for a longer period than a rational agent would. Fisher et al. (2004) document that economic expansions and perceived strength in the real estate market significantly increase the frequency of transactions. The authors also explain that owners' investment strategies are highly associated with the propensity to sell an asset. Sale probability increases as "*expected transaction prices exceed appraised values and as a property's performance exceed the market's performance*". More recently, Amédée-Manesme et al. (2015) analyze the impact of lease structures on the optimal HP for commercial real estate portfolios, and show that, among other things, shorter lease durations, higher market rental value volatility and higher vacancy duration tend to decrease the optimal HP.

In a recent paper analyzing a sample of large institutional assets owned by pension funds and insurance companies, Ambrose and Steiner (2019) find that higher CAPEX spending reduces the likelihood of sale. However, to the best of our knowledge, the link between the timing of CAPEX and the HP has been neglected in the literature, most probably because of the lack of property-level data. In our study, the timing of CAPEX refers to whether the property was renovated before (within 5 years) or after (within 2 years) acquisition[10]. On the one hand, the propensity to hold on to the asset is different when an investor purchases a recently-renovated asset compared to investors who renovate an asset post-acquisition. In the second situation, (i.e. renovations after acquisition), and as pointed out by Ambrose and Steiner (2019), CAPEX spending increases the asset's value for the owner who "*deploys the property under its highest and best use. As a result, expected profit for the current owner from a sale to an alternative owner who would deploy the property under its second-best use declines, reducing the probability of sale.*"

In the context of hotel properties, not much has been done to explain the factors influencing the HP, and we intend to fill this gap. In a first step, we adopt a financing standpoint. Our database is composed of hotel properties that are held by either public (publicly traded) or private companies. Given that stock markets provide the advantage for public companies to benefit from an easier access to capital, and at a lower cost (Acharya and Xu, 2015), we posit that, all other things being equal, listed companies owning hotel properties will hold them for a longer period than non-listed companies. Indeed, listed companies that are willing to acquire new assets, but lack liquidity, have the possibility to attract funds by issuing shares or bonds[11].

[10] We also tested for other horizons, but these models yielded the best results.
[11] An opposite argument could be that it is possible that listed firms are put under pressure by investors to generate short-term profits, which forces them to make sub-optimal investments. Moreover, managers may also have incentives to boost short-term profitability to maximize their compensation related to stock performance, and sacrifice long-term investments to boost short-term stock returns (Acharya and Xu, 2015).

In contrast, private firms might have to dispose of one or more of their asset(s) to generate cash and finance their acquisitions. This leads us to hypothesis 1:

H1: Due to their access to financing via the stock markets, listed firms have longer HPs for hotel properties than non-listed firms (because they do not need to sell some of their holdings to acquire new ones).

However, different types of hotel owners imply different corporate structures, with different objectives, strategies, and investment horizons, which might result in different likelihoods to sell a given asset. Differentiating between listed and non-listed firms might pool together owners with very different characteristics, such as REITs and REOCs. As stated by Tang and Jang (2008), "*the co-existence of REIT and C-Corp formats in the hotel industry provides a unique opportunity to examine the influence of REIT regulatory requirements under a controlled environment.*" In general terms, REITs represent a less flexible organizational structure than Non-REITs (Delcoure and Dickens, 2004; Tang and Jang, 2008). REITs have to meet various requirements set by the Internal Revenue Code: at least 75% of total assets must be invested in real estate-related and government securities; at least 75% of income must come from long-term real estate investments; the ownership must include more than 100 individual investors (top five investors being less than 50% of the outstanding voting shares); and at least 90% of earnings must be distributed in dividends in order to be exempt from income taxes (Ghosh and Sirmans, 2003; Delcoure and Dickens, 2004). We posit that the tax-exempt status of REITs may have a significant impact on their real estate properties' HPs when compared to those of REOCs. So long as a REIT distributes at least 90% of its earnings as dividends, it is exempt from income tax; while Non-REITs (REOCs) are subject to double taxation. As a result, Non-REITs have incentive to sell their existing assets quicker than REITs to acquire new ones, because once they have depreciated significantly, they do not provide attractive tax deductions anymore. Therefore, we posit that these two characteristics induce longer HPs for REITs. This leads us to hypothesis 2:

H2: REOCs have a higher propensity to sell their hotel properties than REITs (because once depreciated to a certain point, assets do not provide attractive tax benefits anymore).

Besides, some property-specific characteristics may impact the HP. Beyond brand, geographical localization, size, age and property type, our unique database offers us the opportunity to control for CAPEX spending. CAPEX is important as it influences firm value (McConnell and Muscarella, 1985; Blose and Shieh, 1997; Vogt, 1997; Ambrose and Steiner, 2019) and property returns (Ghosh and Petrova, 2016). Therefore, we posit that the timing of CAPEX is an important factor in explaining HP. Indeed, buying an asset that has been recently renovated before acquisition means that the best positioning of the property is potentially different from the acquirers' preferences. Yet, the recent CAPEX invested in the property may already have been capitalized in the price and it would be sub-optimal to invest more in CAPEX soon. In contrast, if the acquirer renovated the asset right after acquisition, he would be able to position it optimally based on his own investment philosophy, and has an incentive to hold it longer. This leads us to hypothesis 3:

H3: Hotel properties renovated after acquisition are held for a longer period of time.

Data and Methodology

Our main Source of data is SNL Financial. According to Bloomberg[12], "SNL Financial LC provides business intelligence services. The Company offers the collection and standardization of corporate, financial, and mergers and acquisitions (M&A) data. SNL Financial serves the banking, insurance, real estate, energy, media, and communications industries worldwide." Recently, SNL was acquired by S&P Global Market Intelligence[13].

The purpose of this study is to investigate whether asset characteristics and owner type (listed or non-listed, REIT or REOC), and the timing of cash flows, are associated with the HP of hotel properties. We start with an initial sample of nearly 7,200 US-based hotels currently owned or sold by 380 US companies collected from Standard & Poor's SNL database. Then, we remove nearly 1,000 hotels from our sample for which some critical information was missing such as acquisition date and location. Finally, we use a sample of 6,138 US hotel properties acquired between 1969 and 2018. 57% of the hotels in our sample (3,489) were sold during our period of analysis (1990 through 2018). The data relates to 134 brands and independent hotels. All US states are represented in the sample.

Table 1 defines the variables used in our study. **Table 2** describes the distribution of hotels across various sub-samples. The hotels in our sample are owned by either listed (54%), or non-listed companies (46%), and by REITs (74%), or REOCs (26%). Interestingly, most

[12] See https://www.bloomberg.com/profile/company/84527Z:US
[13] See https://www.spglobal.com/marketintelligence/en/campaigns/snl-financial

REITs appear to be listed (61%), while most REOCs are non-listed (66%). Looking more closely at property types, 43% of the full sample is composed of limited service hotels, followed by extended stay hotels (28%), full service hotels (27%), while budget hotels and "other" represent less than 2% of the sample.

[Insert Table 1 here]

[Insert Table 2 here]

Table 3 provides descriptive statistics for the variables used in the Cox proportional hazard model (described below) for the full sample as well as for the REITs and REOCs subsamples. The average HP for the full sample is 7.82 years, including properties that have not been sold (censored data), while it is shorter for REITs (6.96 years) and longer for REOCs (10.29). Among the 6,138 observations, 46% are related to non-listed companies, and 26% to REOCs. Only a small proportion (6%) are hotel properties that are ground leased (*GRDLEASE*), renovated within 5 years before acquisition (5%) or within 2 years after acquisition (6%). The average property size (number of rooms) is 179 for the full sample, while it is larger for REITs (187 rooms) than for REOCs (158 rooms). The average age of hotels at acquisition time (*AGE_AT_ACQ*) is 15 years. REITs also acquire hotels that are older, on average, than REOCs (17 years versus 11 years). 56% of the REITs subsample are portfolio acquisitions, while this statistic only amounts to 21% for REOCs. Finally, 10% of REITs' properties were acquired through M&A, which is significantly more than the 1% found for REOCs.

[Insert Table 3 here]

HP estimates are inaccurate due to censored observations i.e. hotels which were yet to be sold – and thus implying noisiness in HP – at the time of data collection. In **Table 4**, we provide a detailed summary of HPs (excluding censored data) across property type, owner type and economic region[14]. Focusing only on assets that have been sold, limited-service hotels have the longest average HP (more than 10 years), while budget hotels have the shortest (4.9 years). Non-listed REOCs' properties have, on average, the longest HPs with 10.6 years, while non-listed REITs' properties have the shortest (6.4 years). More interestingly, non-listed REOCs' assets are sold in 100% of cases, while only 31% of listed REITs' properties are sold. In terms

[14] In Appendix A, we provide a table documenting detailed HPs across US cities.

of economic region, assets situated in the Mineral Extraction region have the longest average HP (9.9 years).

[Insert Table 4 here]

To further address the issue of censoring in data, we estimate the "implied" HP of hotels in our sample for the past two decades, as shown in **Figure 1**. The implied HP for a sample of hotel owners is calculated as $\frac{(Prop_t+Prop_{t-1})/2}{Sold_t}$ where *Prop* signifies the number of hotels in the portfolio and *Sold* signifies the number of hotels sold. The subscript *t* indexes time (in years). This method is based on Atkins and Dyl (1997) and Collett, Lizieri, and Ward (2003).

[Insert Figure 1 here]

We can observe significant differences in the HP pattern across owners identified as REITs or Listed. The implied HP in Listed companies appears to be substantially larger and volatile. However, HP estimated in this way appears unrealistically high during early years for the listed firms (varying in the range of 50 to 87 years), or during the sub-prime crisis periods (2008-2011) for all firms. To address this issue, in **Figure 2** we plot average HP for a full sample including censored observations and on a subsample of sold-hotels. Such an analysis will naturally underestimate the HP in recent years. Therefore, we exclude the recent eight years from the graph. As expected, the censored data has a higher HP. In general, the HP of hotels has been decreasing in recent decades (from over 15-17 years to nearly 6-8 years).

[Insert Figure 2 here]

From the descriptive analyses presented above, one could conclude that REOCs have longer HPs than REITs. However, we will show an opposite finding in the following section which utilizes inferential statistics in a multivariable environment.

Survival Functions and Cox Proportional Hazard

Earlier studies have applied survival functions to firm takeovers (Malmendier, Opp and Saidi, 2016), CEO turnover (Jenter and Kanaan, 2015), equity stake changes (Bradley, Pantzalis and Yuan, 2016) and loan survival (Chen and Deng, 2013; Ambrose et al., 2016; Liu and Sing, 2017; Das and Freybote, 2018), among others. For the survival analysis, we posit the sale of a hotel as a "hazard". For hotels that were never sold, the hazard is zero (=0) until the last date of our observation (i.e. 31 December 2018). Such observations are considered to be "censored" as they may still be sold in the future.

A survival function *S(t)* denotes the probability that a hotel continues to be owned by the current owner until its time *t* since acquisition, and *T* is the point of time at which the hazard (i.e. sale) takes place. F(t) = P(T<t) is the hazard function[15] denoting the probability that the hazard was observed by age *t*, and *f(t)* is the probability that the hazard occurs at age *t*.

$$S(t)= P(T \geq t) = 1 - F(t) = \int_t^{\infty} f(x)dx \tag{1}$$

Given the condition that a hotel survived with the given owner (i.e. it was not sold) until the time *t* after acquisition, the baseline hazard rate is:

$$h_0(t) = f(t)/S(t). \tag{2}$$

$h_0(t)$ is the baseline, non-parametric in nature and is the property of a given dataset. The Cox Proportional Hazard (CPH) model applies inferential statistics on the baseline function and explains the hazard function using covariates (*X*):

$$h(t \mid X) = h_0(t)e^{\beta X} \tag{3}$$

Here *X* is a set of covariates: *X* ≡ {*LISTED, NON_LISTED, NON_REIT, GRDLEASE, RENOV_BEFACQ, RENOV_AFTACQ, NB_ROOMS, AGE_AT_ACQ, PF_ACQ, M&A_ACQ*}.

As such, the hazard rate across two hotels (say, p and q) will maintain the same ratio (i.e. $h_p(t)/h_q(t)$ is a constant) across different durations (*t*) after acquisition.

Results

Figure 3 provides the Kaplan-Meier survival function for the overall sample. Nearly 20% of the hotels are sold by the first five years of the HP. By the first ten years of HP, nearly 60% of the hotels are already sold. Virtually 80% of all hotels are sold in the first 20 years of HP and all hotels are sold within a 50-year HP.

[Insert Figure 3 here]

[15] We provide a more detailed description of survival and hazard functions in Appendix B.

In the next illustration (**Figure 4**), we analyze the survival duration across property types. Budget hotels tend to have the lowest survival rate (*HP*) whereas higher quality hotels tend to have a longer HP.

[Insert Figure 4 here]

Next, we analyze the difference across owner types as shown in **Figure 5**. Contrary to descriptive statistics, we find the highest survival rates in listed REITs and listed REOCs. Hotels owned by non-listed REITs have the shortest HP (survival rate). Non-listed REOCs (Non-REITs) also exhibit shorter survival rates.

[Insert Figure 5 here]

These survival curves led us to control for the sub-sampling criteria in our Cox proportional hazard (CPH) models described below. **Table 5** presents the results of our initial CPH models. After controlling for various factors including property type, geographic region, brand and institution fixed effects, we find in column 1 that the coefficient on *NON_LISTED* is strongly positive and significant at the 1% threshold. In other words, all else equal, non-listed firms have a higher propensity to sell their assets (a shorter HP) than listed firms, which supports hypothesis 1.

[Insert Table 5 here]

In column 2, we document a positive and significant (at the 1% threshold) association between NON_REIT (i.e. REOC) and the propensity to dispose of assets, which supports hypothesis 2. All else equal, REOCs hold their assets for a shorter period of time, which we explain by the fact that after a given number of years, hotel properties do not provide enough tax benefits anymore (unlike REITs, which are not concerned with this issue given their tax-exempt status).

Column 3 of **Table 5** provides additional insights regarding the comparison of the four subgroups of interest (listed and non-listed REITs, and listed and non-listed REOCs). With listed REITs as our baseline, we show that listed REOCs do not have significantly higher HPs than listed REITs. In other words, the listing factors appear to be the one that matters. Moreover, non-listed firms (REITs of REOCs) have both significantly shorter HPs than listed firms, as shown by the positive and significant (at the 1% threshold) coefficients on *NON_LISTED*REIT* and *NON_LISTED*NON_REIT*. Overall, these results show that the "listed versus non-listed" factor is more important in explaining the HP than REIT versus REOC. In column 4, following Das, Freybote & Marcato (2015), we include in our model macroeconomic variables, including market return in excess of the risk-free rate (*MKT*), yield spread between 10-year Treasury bonds and the risk-free rate (*TERM*), yield spread between Moody's BAA-rated bonds and the risk-free rate (*DEFAULT*), NCREIF Property Index return in excess of the risk-free rate (NPI), Hotel REIT Index return in excess of the risk-free rate (*HREIT*). Overall, except MKT, all macroeconomic controls are highly significant, and our main results hold.

MKT is a broader-level stock market index and its insignificance is not surprising to a niche (i.e. hotel property) asset class. However, hotel dispositions are positively associated with increased returns on hotel REITs (*HREIT*) and commercial property returns (*NPI*). The *TERM* spread reflects the slope of the yield curve and signals future inflationary expectations. Hotel dispositions are negatively associated with the yield curve. The *DEFAULT* spread reflects increased risk perception in the debt markets which has a positive coefficient. Our findings related to macroeconomic factors suggest an opportunistic disposition adopted by hotel owners who want to capitalize on higher returns (*HREIT*, *NPI*), and dispose assets when the debt markets turn more expensive (*DEFAULT*). However, there is a tendency to hold on to the hotels when future economic prospects (*TERM*) are promising controlling for other factors.

Regarding the timing of cash flows, and more precisely renovations in our context, in columns 1 to 4 we document that, when looking at the full sample, the fact that the hotel has been renovated within 5 years before acquisition (*RENOV_BEFACQ*) impacts positively and significantly (at the 1% threshold) the propensity to sell an asset. In other words, when the buyer isn't involved in the renovation, the acquisition is not made with the intent to operate the hotel in the long run. The coefficient for post-acquisition renovation is never significant.

It appears that the coefficient on *GRDLEASE* is systematically (except in column 4) negative and significant (at the 5% threshold), meaning that ground leased assets have a longer HP. Hotels built on leased land are less attractive to prospective buyers which adds to their illiquidity. Our findings provide an analogy for illiquid stocks (Demsetz, 1968; Tinic, 1972; Amihud and Mendelson, 1986; Hess, 1991; Bhide, 1993; Umlauf; 1993; and Atkins and Dyl, 1997) into hotel property markets. We interpret this result as evidence that firms sell the assets that are easy to sell, which is not the case for ground leased assets. In the same vein, the age of the building at acquisition date (*AGE_AT_ACQ*) positively impacts the propensity of the owner to sell. Indeed, older properties have a shorter HP, all else equal. This finding may also be explained by liquidity. Older hotels have higher visibility, which enhances their liquidity (Das, Smith, and Gallimore, 2018). Hotel properties acquired through a portfolio acquisition (*PF_ACQ*) or through M&A (*M&A_ACQ*) are both related to shorter HPs. A hotel acquired as a part of a portfolio or through an M&A deal is often similar to several other assets purchased as a group, thus increasing their liquidity. However, these assets may not necessarily fit well with the specific set of assets already accumulated by the acquirers who is interested in disposing of them sooner.

Practical Application

Predicting the Holding Period

As discussed earlier, a rigid assumption related to the going-out capitalization – which is agnostic to the selection of a HP – is a source of valuation error. However, the survey respondents[16] subconsciously report their estimate of the capitalization rate based on their perceived HP, which tends to be specific to an asset. Therefore, the DCF pro-forma should use the "typical" HP estimated for each asset. Our analyses above present a robust evidence that the HP can vary drastically across asset characteristics and market conditions. In this section, we focus on how to predict the HP of a specific asset.

Accelerated Failure Time Model

Accelerate Failure Time (AFT) models are parametric in nature and explain how the HP ("survival time") is determined by predictor variables. If T is the HP and X is a vector of asset attributes:

$$T = \theta e^{(\beta_0+\beta_1 X)} \quad (4)$$

Here β_0 and β_1 are AFT regression parameters. θ is a function of estimation error, the quantile of HP (e.g. median) and the scale factor suggested by the AFT model. If B_0 and B are regression coefficients and ϵ is the disturbance such that $e = \sigma\epsilon$ and e is i.i.d. from a normal distribution N(0, σ^2), the model can be empirically specified as:

$$Ln(T) = B_0 + BX + \sigma\epsilon \quad (5)$$

[16] The discount rate and capitalization rate for DCF valuation are derived based on the survey estimates.

In this equation the regression coefficients (B_0 and B) are provided by a maximum-likelihood estimator. As such, σ is the "scale parameter" suggested by the empirical model when fitting a Weibull model to the holding period model. If *i* indexes a specific asset, the median holding period survival can be estimated by applying the following function:

$$MedianSPELL_i = (ln2)^{scale}.e^{(B_0+X_iB)} \quad (6)$$

[Insert Table 6 here]

In **Table 6** we present the results from our AFT model. Note that our objective is to predict the HP ex-ante. For example, one may be interested in estimating the number of years before the current owner will likely sell the asset. This renders the market conditions (at the time of asset disposition) irrelevant for the ex-ante prediction, as these conditions are not known in advance. Therefore, we remove market variables from the predictive models. The first model includes all other variables included in our earlier proportional hazard models. Such a model is best for structural modeling. However, the presence of a large number of dummy variables e.g. Brand and (owning) Institution restrict the practical use of the model. Therefore, in the second "Parsimonious" model, we remove these two sets of dummy variables and report the coefficients of all the variables included. The parsimonious model offers a useful tool to predict the median HP based on the equation above. However, we suggest to run a complete model for prediction based on data availability. For illustration purposes, let us consider three specific assets with the following characteristics:

Hotel A: *A brand new, 100-room budget hotel acquired by a non-listed REOC in the Southwest (SW) region. This hotel has no ground lease, was never renovated or acquired through portfolio/M&A acquisition. The predicted holding period is nearly 5 years.*

Hotel B: *A 15-year old, 300-room extended stay hotel acquired by a listed REIT in the West-Northcentral (WN) region. This hotel has a ground lease, was renovated before (and after acquisition) and was bought through a portfolio acquisition. The predicted holding period is nearly 20 years.*

Hotel C: *A 50-year old, 300-room full-service hotel acquired by a listed REOC in the Puerto Rico region. This hotel has a ground lease, was renovated before (and after* *acquisition) and was bought through an M&A deal. The predicted holding period is nearly 15 years.*

[Insert Table 7 here]

In **Table 7**, we code the information about the three hotels into the variables as shown. The first column includes the parametric estimations from the "Parsimonious" AFT model presented above. For each hotel, the value for "Constant" is set as one to include the intercept into estimation. For each hotel, $X_i\beta$ is the sum-product of the array of parameters and the array of hotel attributes. The last row shows the median HP estimation for each of the three example hotels.

Table 7 can be used to calculate the median HP of any hotel as long as the information related to the parameters presented are available. Applying thusly estimated HP in the DCF analysis will not only provide a more realistic estimate of valuation, it may also help with standardizing the estimation of HP in the industry.

The Need for Correcting the Discount Rate

In the previous section, we describe how to apply our models to estimate the holding period of a hotel. In the following section, we first show that the prevalent valuation methods are prone to valuation errors depending on the choice of the holding period. Then, we provide a method to adjust the discount rate.

Once the holding period is estimated, DCF analysts could develop a more realistic cash flow projection for an asset for valuation or anticipating sale-related cash flows. In an ideal setting, to keep the cash flow projections realistic, it is advisable that the analyst first estimates the expected (median) holding period for the subject asset, develops a cash flow pro-forma for thusly estimated HP and then adjust the discount rate as described below. For investment analysis purposes, this approach is always advisable. However, in several cases, the estimated holding periods may be too long such that it is impractical to estimate market values over long HPs, and it is more intuitive to adjust the discount rate. The common practice is to fix the HP (usually to 5 or 10 years).

To understand the nature of discount rate adjustment, we simulated multiple scenarios. Mimicking the industry practice, we assume that the stabilized growth rate g, going-in and going-out capitalization rates (γ_{in} and γ_{out} respectively) and their spread ($\Delta = \gamma_{out} - \gamma_{in}$) are fixed at the outset, independent of the holding period. The prevalent practice of reporting γ_{in} and γ_{out} concurrently (and γ_{out} independent of the HP) is shown in **Figure 6** using an example of Miami hotels market**.**

[Insert Figure 6 here]

We simulate multiple scenarios with γ_{in} ranging between 4% and 10%, Δ ranging between 25 bps to 100 bps, and g ranging between 1% and 5%. For simplicity, the cash flows are assumed to be stabilized from the beginning such that the first-year cash flow projection divided by γ_{in} reflects the "true" value of the hotel. Now, we estimate the hotel value across differently assumed holding periods (2 to 50 years) as follows:

$$V_0^* = \sum_{i=1}^{\tau} \frac{NOI_i}{(1+\Omega)^i} + \frac{NOI_{t+1}}{\gamma_{out} \cdot (1+\Omega)^t} \tag{7}$$

Here, NOI refers to net operating income, $\Omega = \gamma_{in} + g$ is the discount rate, and τ is the holding period (HP). As γ_{out} is fixed, different HPs lead to different value estimates. **Figure 7** depicts a specific set of valuation parameters to show the need for adjusting the discount rate to ensure that the valuation is stable across the assumed HPs. The scenario can be generalized for different sets of valuation parameters.

[Insert Figure 7 here]

We use brute-force computer algorithms to calculate the equivalent discount rate for each selected HP which could lead to the "true" value of the asset. Finally, we run a regression model[17] to fit the adjusted discount rate as a function of γ_{in}, g, Δ and HP which leads to the following:

$$\Omega_{adj} = [\gamma_{in} + g] + \delta \tag{8}$$

$$\delta = \frac{-0.1 + 1.2 * \gamma_{in} - 14 * \Delta}{HP} \tag{9}$$

[17] The regression models based on the simulated data have high R-squared (90% or more). The results are available upon request.

The quantity in the parenthesis (EQ 8) is the conventionally used discount rate. δ is the adjustment recommended by this study.

Here is an illustrative example: consider a valuation exercise where the going in capitalization rate is 8%, the stabilized cash flows are expected to grow at 2% and the going-out capitalization rate is higher by a spread of 50 bps. The holding period considered spans 5 years. The convention (unadjusted) discount rate will be: $[\gamma_{in} + g] = 8\% + 2\% = 10\%$. The adjustment $\delta = \frac{-0.1+1.2*8\%-14*0.5\%}{5} \approx$ 1.5%. Therefore, $\Omega_{adj} \approx$ 8.5%. In the above scenario, if HP is considered to be 10 years, the adjustment is only -0.75%, suggesting a discount rate of 9.25%.

Conclusion

As real estate assets, hotels are actively bought or sold. The sale of a hotel has major monetary implications for various parties including buyers, sellers, lenders, tax authorities, appraisers, lawyers and consultants. Besides, the time period before an acquired hotel is sold (i.e. the holding period: HP) is critical to cash flow projections, valuation and investment analysis. Moreover, predicting the timing of sale is of strategic importance to lenders, consultants, owners and investors. However, our knowledge regarding the HP prediction of hotels is very limited and mostly anecdotal. In this study we investigate the determinants of the HP in terms of owner type, acquisition conditions and the timing of hotel renovation. In particular, we explain the factors that significantly affect the holding period. Further, we also provide examples on practical application of a parametric modeling framework for predicting the holding period of an asset based on its attributes.

First, we apply a Kaplan-Meier Survival function to analyze the HP of hotels in our sample and describe how HPs vary across hotel attributes (e.g. hotel type and owner type). Then, using semi-parametric Cox Proportional Hazard models, we document that listed REITs and REOCs have longer HPs than non-listed ones. Next, we confirm the hypothesis that differential HPs across owner types are caused by financing-based motivations. Listed companies have access to big-ticket financing via the stock and bond markets, and are less motivated to liquidate their assets for finance reasons. Being tax-free entities, REITs are less motivated to sell the assets acquired a long time ago, thus inflating their HP compared to REOCs. However, in non-listed REITs, which focus on strategically recycling their property portfolio, the indifference towards tax is overwhelmed by the need for liquidity. As a result, such owners tend to sell their assets more frequently, leading to shorter HPs. Finally, we show that properties renovated after acquisition have a longer HP as renovation is a strategic decision for holding the assets. This effect is stronger in REITs and listed companies.

Further, we apply a parametric, Accelerated Failure Time (AFT) modeling framework useful in predicting holding periods on censored data. Using an AFT model, we also provide an indicative tool that can be used by practitioners to predict the HP ex-ante conditional on the hotel and owner characteristics. It is advisable that analysts develop the AFT models best suited to the context (e.g. asset type, country, etc.). Finally, in the context of valuation, we present a method to adjust the DCF discount rate according to the selected holding period.

Our study provides robust evidence on the determinants of hotel HPs in the US context and puts forwards various unexplored topics for future research. For example, what is the impact of the market cycle on hotel properties HP? Do geographic parameters such as the density of hotel properties with a given zone influence the HP decisions? Do country-specific institutional factors impact hotel properties HPs? Does institutional ownership influence the HP of a hotel property? HP is a very important subject in accounting, finance and real estate, and providing answers to such questions might be useful to various stakeholders, directly or indirectly involved in valuation, such as analysts, advisors, regulators, managers, board members, but also academics teaching valuation methods to future practitioners.

We acknowledge some limitations in our study – primarily as we do not have access to the relevant data – that should be addressed in future research. For example, incorporating asset-level performance data – which, by the way, is not the focus of our study – may provide further insights into the phenomenon. However, our paper provides a “template” for such an analysis and prediction in the context of a data-rich country. Future research could integrate international coverage of such analyses.

References

Acharya, V., & Xu, Z. (2017). Financial dependence and innovation: The case of public versus private firms. *Journal of Financial Economics*, 124(2), 223-243.

Ambrose, B. W., Sanders, A. B., & Yavas, A. (2016). Servicers and Mortgage-Backed Securities Default: Theory and Evidence. *Real Estate Economics*, 44(2), 462–489.

Amihud, Y., & Mendelson, H. (1986). Asset pricing and the bid-ask spread. *Journal of Financial Economics*, 17(2), 223-249.

Amédée-Manesme, C. O., Baroni, M., Barthélémy, F., & Mokrane, M. (2015). The impact of lease structures on the optimal holding period for a commercial real estate portfolio. *Journal of Property Investment & Finance*, 33(2), 121-139.

Atkins, A. B., & Dyl, E. A. (1997). Transactions costs and holding periods for common stocks. *Journal of Finance*, 52(1), 309-325.

Barthélémy, F., & Prigent, J. L. (2009). Optimal time to sell in real estate portfolio management. *The Journal of Real Estate Finance and Economics*, 38(1), 59-87.

Bhide, A. (1993). The hidden costs of stock market liquidity. *Journal of Financial Economic*s, 34(1), 31-51.

Blose, L. E., & Shieh, J. C. (1997). Tobin's q-Ratio and market reaction to capital investment announcements. *Financial Review*, 32(3), 449-476.

Bradley, D., Pantzalis, C., & Yuan, X. (2016). The influence of political bias in state pension funds. *Journal of Financial Economics*, 119(1), 69–91.

Camilleri, D. (2015). Hotel valuations earning multipliers – terminal value: Malta’s scenario. *Journal of Property Investment and Finance*, 33(3), 212–241.

Chen, J., & Deng, Y. (2013). Commercial Mortgage Workout Strategy and Conditional Default Probability: Evidence from Special Serviced CMBS Loans. *The Journal of Real Estate Finance and Economics*, 46(4), 609–632.

Chen, M.-H., & Kim, W. G. (2009). Hotel Valuation in China. *Cornell Hospitality Quarterly*, 51(3), 429–445.

Collett, D., Lizieri, C., & Ward, C. (2003). Timing and the holding periods of institutional real estate. *Real Estate Economics*, 31(2), 205-222.

Das, P. (2015). Revisiting the hotel capitalization rate. *International Journal of Hospitality Management*, 46, 151–160.

Das, P., Freybote, J., & Marcato, G. (2015). An investigation into sentiment-induced institutional trading behavior and asset pricing in the REIT market. *The Journal of Real Estate Finance and Economics*, 51(2), 160-189.

Das, P., & Freybote, J. (2018). Investor Sentiment and Prepayment Hazard: The Case of Multifamily MBS Loans. *Working Paper*. April 2018.

Das, P., Smith, P., & Gallimore, P. (2018). Pricing Extreme Attributes in Commercial Real Estate: the Case of Hotel Transactions. *The Journal of Real Estate Finance and Economics*, 1-33.

Delcoure, N., & Dickens, R. (2004). REIT and REOC systematic risk sensitivity. *Journal of Real Estate Research*, 26(3), 237-254.

Demsetz, H. (1968). The cost of transacting. *The Quarterly Journal of Economics*, 82(1), 33-53.

Desai, M. (2017). *The wisdom of finance: Discovering humanity in the world of risk and return*. Houghton Mifflin Harcourt.

Fisher, J., Gatzlaff, D., Geltner, D., & Haurin, D. (2004). An analysis of the determinants of transaction frequency of institutional commercial real estate investment property. *Real Estate Economics*, 32(2), 239-264.

Fleischer, A. (2012). A room with a view-A valuation of the Mediterranean Sea view. *Tourism Management*, 33(3), 598–602.

Ganchev, O. (2007). Applying Value Drivers to Hotel Valuation. *Cornell Hotel and Restaurant Administration Quarterly*, 41(5), 78–89.

Ghosh, C., & Petrova, M. T. (2017). The impact of capital expenditures on property performance in commercial real estate. *The Journal of Real Estate Finance and Economics*, 55(1), 106-133.

Ghosh, C., & Sirmans, C. F. (2003). Board independence, ownership structure and performance: evidence from real estate investment trusts. *The Journal of Real Estate Finance and Economics*, 26(2-3), 287-318.

Hess, A. C. (1991). The effects of transaction costs on households' financial asset demands. *Journal of Money, Credit and Banking*, 23(3), 383-409.

Jenter, D., & Kanaan, F. (2015). CEO Turnover and Relative Performance Evaluation. *Journal of Finance*, 70(5), 2155–2184.

Kim, J., & Jang, S. S. (2012). Do hotel REIT companies face investment constraints? A comparison with C-corporation hotel companies. *International Journal of Hospitality Management*, 31(2), 573-578.

Kim, H., Mattila, A. S., & Gu, Z. (2002). Performance of hotel real estate investment trusts: a comparative analysis of Jensen indexes. *International Journal of Hospitality Management*, 21(1), 85-97.

Kim, S. H., Noh, S., & Lee, S. K. (2019). Asset-light strategy and real estate risk of lodging C−corps and REITs. *International Journal of Hospitality Management*, 78, 214-222.

Liu, B., & Sing, T. F. (2017). “Cure” Effects and Mortgage Default: A Split Population Survival Time Model. *The Journal of Real Estate Finance and Economics*.

Malmendier, U., Opp, M. M., & Saidi, F. (2016). Target revaluation after failed takeover attempts: Cash versus stock. *Journal of Financial Economics*, 119(1), 92–106.

McConnell, J. J., & Muscarella, C. J. (1985). Corporate capital expenditure decisions and the market value of the firm. *Journal of Financial Economics*, 14(3), 399-422.

Nicolau, J. L., & Santa-María, M. J. (2013). The effect of innovation on hotel market value. *International Journal of Hospitality Management*, 32(1), 71–79.

O'Neill, J. W. (2011). Hotel occupancy: Is the three-year stabilization assumption justified?. *Cornell Hospitality Quarterly*, *52*(2), 176-180.

Puciato, D. (2016). Attractiveness of municipalities in South-Western Poland as determinants for hotel chain investments. *Tourism Management*, 57, 245–255.

Ro, S., & Ziobrowski, A. J. (2011). Does Focus Really Matter? Specialized vs. Diversified REITs. *The Journal of Real Estate Finance and Economics*, 42(1), 68–83.

Roubi, S., & Litteljohn, D. (2004). What makes hotel values in the UK? A hedonic valuation model. *International Journal of Contemporary Hospitality Management*, 16, 175–181.

Saló, A., Garriga, A., Rigall-I-Torrent, R., Vila, M., & Fluvià, M. (2014). Do implicit prices for hotels and second homes show differences in tourists' valuation for public attributes for each type of accommodation facility? *International Journal of Hospitality Management*, 36, 120–129.

Tang, C. H. H., & Jang, S. S. (2008). The profitability impact of REIT requirements: A comparative analysis of hotel REITS and hotel C-Corporations. *International Journal of Hospitality Management*, 27(4), 614-622.

Tinic, S. M. (1972). The economics of liquidity services. *The Quarterly Journal of Economics*, 79-93.

Umlauf, S. (1993). Transaction Taxes and Stock Market Behavior: The Swedish Experience. *Journal of Financial Economics*, 33, 227–240.

Vogt, S. C. (1997). Cash flow and capital spending: Evidence from capital expenditure announcements. *Financial management*, 44-57.

Wang, K., Grissom, T., & Chan, S. (1990). The Functional Relationship and Use of Going-in and Going-out Capitalization Rates. *Journal of Real Estate Research*, *5*(2), 231-245.

Webb, J., Chau, K., & Li, L. (1997). Past and future sources of real estate returns in Hong Kong. *Journal of Real Estate Research*, *13*(3), 251-271.

Table 1. Variables and Measurement

Variable	Measurement	Source
HP	Holding period in years, calculated between the date of acquisition and sale date. For un-sold properties, it is "censored" i.e. based on the most recent date of observation.	SNL
NON_LISTED	Dummy variable equal to 1 if the firm is not listed, and 0 otherwise.	SNL
LISTED	Dummy variable equal to 1 if the firm is listed, and 0 otherwise.	SNL
NON_REIT	Dummy variable equal to 1 if the firm is not a REIT, and 0 otherwise.	SNL
REIT	Dummy variable equal to 1 if the firm is a REIT, and 0 otherwise.	SNL
RENOV_BEFACQ	Dummy variable equal to 1 if the property was renovated within 5 years before acquisition, and 0 otherwise.	SNL
RENOV_AFTACQ	Dummy variable equal to 1 if the property was renovated within 2 years following acquisition, and 0 otherwise.	SNL
GRDLEASE	Dummy variable equal to 1 if the property is ground leased, and 0 otherwise.	SNL
NB_ROOMS	Total number of rooms in the hotel property.	SNL
AGE_AT_ACQ	Age of the hotel property when it was acquired.	SNL
PF_ACQ	Dummy variable equal to 1 if it is a portfolio acquisition, and 0 otherwise.	SNL
M&A_ACQ	Dummy variable equal to 1 if the property was acquired through M&A, and 0 otherwise.	SNL
*Macroeconomic Time Series**		
MKT	Stock market (S&P500) return in excess of the risk-free rate	St. Louis Fed. Res.
TERM	Yield Spread between 10-Year Treasury Bond and the risk-free rate	St. Louis Fed. Res.
DEFAULT	Yield Spread between Moody's BAA-rated bond and the risk-free rate	St. Louis Fed. Res.
NPI	NCREIF Property Index return in Excess of the risk-free rate	NCREIF
HREIT	Hotel REIT Index return in excess of the risk-free rate	SNL

***** Macroeconomic variables correspond to quarterly measures corresponding to the last quarter of observation for each hotel.

Table 2. Sample Distribution across Owner and Property Types

	Full sample (N=6,138)		REITs (N=4,549)		REOCs (N=1,589)	
	N	%	N	%	N	%
Owner type						
Listed	3,330	54%	2,790	61%	542	34%
Non-listed	2,808	46%	1,759	39%	1,047	66%
Total	6,138	100%	4,549	74%	1,589	26%
Property type						
Budget	22	0%	19	0%	3	0%
Extended stay	1,721	28%	1,080	24%	642	40%
Full service	1,661	27%	1,312	29%	348	22%
Limited service	2,662	43%	2,074	46%	588	37%
Other	72	1%	64	1%	8	1%
Total	6,138	100%	4,549	100%	1,589	100%

Notes: Variable descriptions are provided in Table 1.

Table 3. Descriptive Statistics

Variable	Mean	SD	Min	Median	Max
Full sample (N=6,138)					
HP* (in years)	7.82	6.87	0.04	6.45	49.28
NON_LISTED	0.46	0.50	0.00	0.00	1.00
NON_REIT	0.26	0.56	0.00	0.00	1.00
RENOV_BEFACQ	0.05	0.22	0.00	0.00	1.00
RENOV_AFTACQ	0.06	0.24	0.00	0.00	1.00
GRDLEASE	0.06	0.23	0.00	0.00	1.00
NB_ROOMS	179.39	153.74	21	128.00	2860
AGE_AT_ACQ**	15.28	17.35	-5.00	12.00	278.00
PF_ACQ	0.47	0.50	0.00	0.00	1.00
M&A_ACQ	0.08	0.27	0.00	0.00	1.00
REITs (N=4,549)					
HP* (in years)	6.96	5.84	0.04	5.64	32.61
NON_LISTED	0.39	0.49	0.00	0.00	1.00
RENOV_BEFACQ	0.06	0.23	0.00	0.00	1.00
RENOV_AFTACQ	0.07	0.26	0.00	0.00	1.00
GRDLEASE	0.07	0.25	0.00	0.00	1.00
NB_ROOMS	186.58	161.71	21	133.00	2860
AGE_AT_ACQ**	16.68	18.31	-5.00	12.00	278.00
PF_ACQ	0.56	0.50	0.00	0.00	1.00
M&A_ACQ	0.10	0.30	0.00	0.00	1.00
REOCs (N=1,589)					
HP* (in years)	10.29	8.72	0.22	8.24	49.28
NON_LISTED	0.66	0.47	0.00	0.00	1.00
RENOV_BEFACQ	0.03	0.17	0.00	0.00	1.00
RENOV_AFTACQ	0.03	0.16	0.00	0.00	1.00
GRDLEASE	0.03	0.16	0.00	0.00	1.00
NB_ROOMS	158.26	124.88	37.00	120	1641
AGE_AT_ACQ**	11.29	13.50	-3.00	11	178.00
PF_ACQ	0.21	0.41	0.00	0.00	1.00
M&A_ACQ	0.01	0.09	0.00	0.00	1.00
Quarterly Time Series (1997 Q1 to 2018 Q4)					
MKT	0.36	3.47	-9.59	0.56	7.66
TERM	1.70	1.10	-0.70	1.76	3.57
DEFAULT	4.23	1.66	1.19	4.60	8.65
NPI	2.33	2.21	-8.29	2.66	5.43
HREIT	0.29	17.01	-46.70	-0.26	73.82

Notes: Variable descriptions are provided in Table 1.
*Includes censored observations (i.e. properties that were not sold until the last date of sample collection). **Some hotels were acquired in pre-construction stages implying a negative age.

Table 4. Summary of Hotels Sold and their Holding Period Across Sub-samples

		Holding Period in Years (if Sold)			
	Sold %	Mean	Min	Max	SD
By Property Type					
Budget Hotel	95%	4.9	1.4	13.8	2.7
Extended Stay Hotel	48%	5.8	0.1	19.0	2.7
Full-Service Hotel	67%	7.7	0.0	27.5	5.1
Limited-Service Hotel	59%	10.2	0.1	49.3	9.4
Other	34%	5.6	0.2	20.5	6.3
By Owner Type					
Listed REOCs	20%	6.6	0.2	22.3	4.8
Non-listed REOCs	100%	10.6	0.2	49.3	9.4
Listed REITs	31%	7.7	0.0	32.5	5.8
Non-listed REITs	83%	6.4	0.1	23.1	4.2
By Economic Region					
Farm Belt	64%	9.3	0.1	40.0	7.2
Industrial Midwest	59%	7.6	0.1	43.0	5.2
Mid-Atlantic Corridor	53%	6.7	0.6	27.5	4.3
Mineral Extraction	55%	9.9	0.0	49.3	10.1
New England	57%	7.0	0.1	27.1	5.0
New South	60%	7.9	0.1	39.9	6.1
Northern California	53%	7.9	0.3	48.0	6.6
Southern California	55%	8.0	0.1	44.7	7.1
Not classified	35%	3.0	1.1	13.7	3.3

Notes: Variable descriptions are provided in Table 1. The table is based on a sample of 6,138 hotels acquired between 1990 and 2018 in the US as covered by the S&P SNL database.

Table 5. Cox Proportional Hazard Models for Asset Disposition

Variables	(1)	(2)	(3)	(4)
NON_LISTED	2.134***			
	(0.188)			
NON_REIT		3.008***		
		(0.725)		
LISTED*NON_REIT			0.878	0.296
			(0.751)	(0.768)
NON_LISTED*REIT			2.685***	1.377*
			(0.731)	(0.749)
NON_LISTED*NON_REIT			3.012***	1.677**
			(0.728)	(0.746)
RENOV_BEFACQ	0.313***	0.310***	0.309***	0.344***
	(0.106)	(0.104)	(0.104)	(0.103)
RENOV_AFTACQ	0.034	0.032	0.031	-0.030
	(0.095)	(0.093)	(0.093)	(0.093)
GRDLEASE	-0.174**	-0.175**	-0.174**	-0.115
	(0.086)	(0.085)	(0.085)	(0.085)
ROOMS	-0.0003	-0.0003	-0.0003	-0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)
AGE_AT_ACQ	0.004***	0.003***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
PF_ACQ	0.332***	0.326***	0.334***	0.357***
	(0.059)	(0.057)	(0.058)	(0.058)
M&A_ACQ	0.215*	0.208*	0.206*	0.197
	(0.129)	(0.122)	(0.123)	(0.124)
MKT				0.008
				(0.014)
TERM				-0.863***
				(0.073)
DEFAULT				0.702***
				(0.050)
NPI				0.188***
				(0.021)
HREIT				0.012***
				(0.003)
Property Type	Yes	Yes	Yes	Yes
Geographic Region	Yes	Yes	Yes	Yes
Brand	Yes	Yes	Yes	Yes
Institution	Yes	Yes	Yes	Yes
Observations	6,138	6,138	6,138	6,138
Pseudo R2	0.383	0.416	0.438	0.497
Log Likelihood	-25,211.290	-25,042.380	-24,923.890	-24,583.880
LR Test	2,962.725***	3,300.552***	3,537.538***	4,217.563***

Notes: Variable descriptions are provided in Table 1. ***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

Table 6. Parametric Accelerate Failure Time Function

	AFT	AFT (Parsimonious)
Owning Institution (Reference Group = Non-Listed REOCs)		
Listed Non-REIT	2.153***	0.638***
	(0.197)	(0.069)
Listed REIT	1.725***	0.492***
	(0.440)	(0.034)
Non-Listed REIT	0.492***	-0.387***
	(0.071)	(0.030)
Property Type (Reference Group = Budget)		
Extended Stay	-1.911***	0.976***
	(0.415)	(0.141)
Full-Service	0.068	0.803***
	(0.378)	(0.142)
Limited-Service	-0.00003	1.125***
	(0.384)	(0.141)
Other	-0.098	0.127
	(0.391)	(0.201)
RENOV_BEFACQ	-0.043	-0.121**
	(0.039)	(0.057)
RENOV_AFTACQ	0.512***	0.511***
	(0.032)	(0.037)
GRDLEASE	0.104***	0.133***
	(0.033)	(0.050)
PF_ACQ	-0.186***	-0.346***
	(0.022)	(0.025)
M&A_ACQ	-0.044	-0.337***
	(0.045)	(0.048)
ROOMS	0.0001*	0.0003***
	(0.0001)	(0.0001)
AGE_AT_ACQ	-0.003***	-0.005***
	(0.0004)	(0.001)
Geographic Region (Reference Group = EN)		
ME	0.032	-0.003
	(0.031)	(0.044)
MT	0.023	0.116**
	(0.033)	(0.049)
NE	-0.008	-0.061
	(0.031)	(0.044)
PC	0.040	0.068
	(0.031)	(0.044)
PEURTO	0.073	-0.004
	(0.186)	(0.266)
SE	-0.002	0.042
	(0.028)	(0.040)
SW	0.080***	0.270***
	(0.030)	(0.044)
WN	0.049	0.091
	(0.040)	(0.056)
Constant	1.898***	1.480***
	(0.382)	(0.147)
Scale	0.399	0.632
Brand	Yes	No
Institution	Yes	No
Observations	6,138	6,138
Log Likelihood	-9,323.368	-11,412.260
c	6,197.832*** (df = 213)	2,020.045*** (df = 22)

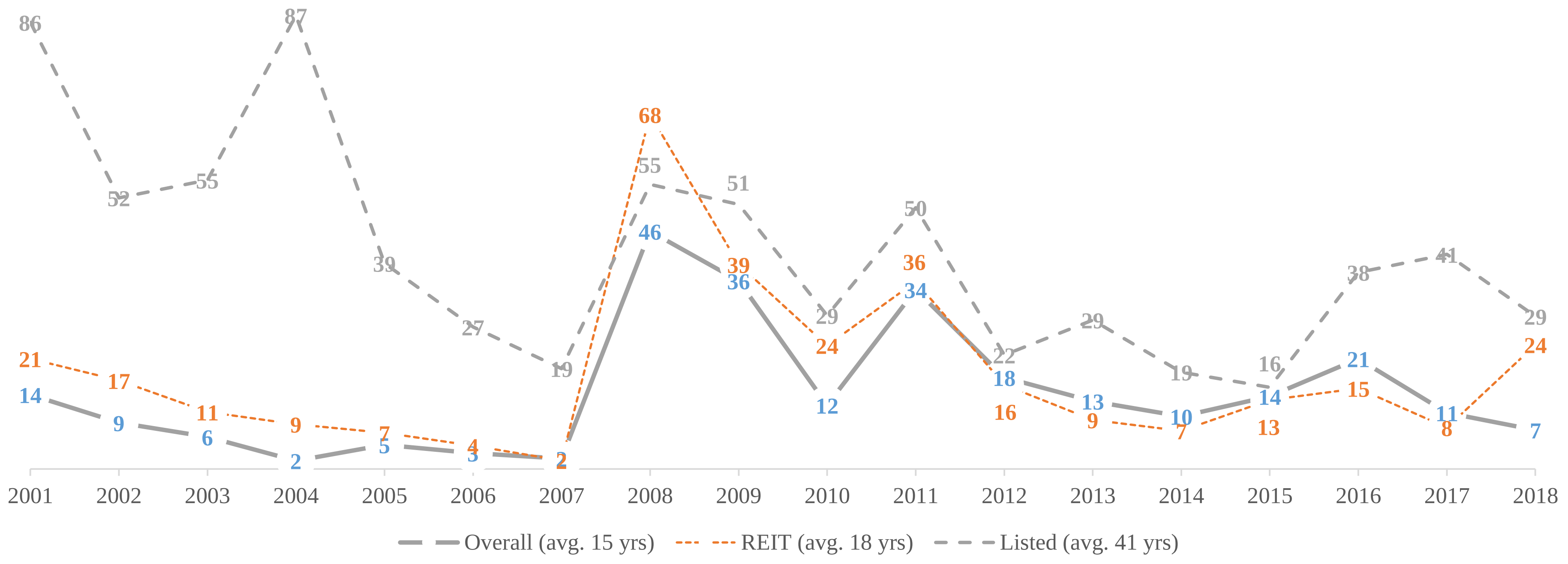
Notes: Variable descriptions are provided in Table 1. ***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

Table 7. Practical Application for Holding Period Estimate: Some Examples

	Parameters	Hotel A	Hotel B	Hotel C
Constant	1.480	1	1	1
Listed REOC	0.638	0	0	1
Listed REIT	0.492	0	1	0
Non-listed REIT	-0.387	0	0	0
Extended Stay	0.976	0	1	0
Full-Service	0.803	0	0	1
Limited-Service	1.125	0	0	0
Other	0.127	0	0	0
Renovated before Acquisition	-0.121	0	1	1
Renovated after Acquisition	0.511	0	1	1
Ground Lease	0.133	0	1	1
Portfolio Acquisition	-0.346	0	1	0
M&A Acquisition	-0.337	0	0	1
Rooms	0.000	100	300	300
Age at Acquisition	-0.005	0	15	50
ME	-0.003	0	0	0
MT	0.116	0	0	0
NE	-0.061	0	0	0
PC	0.068	0	0	0
PEURTO	-0.004	0	0	1
SE	0.042	0	0	0
SW	0.270	1	0	0
WN	0.091	0	1	0
$X_i\beta$		1.46	3.231	2.934
$e^{(X_i\beta)}$		5.93	25.30	18.97
$(ln2)^{scale}$		0.79	0.79	0.79
Median HP $=(ln2)^{0.632}e^{(X_i\beta)}$		4.70	20.07	15.05

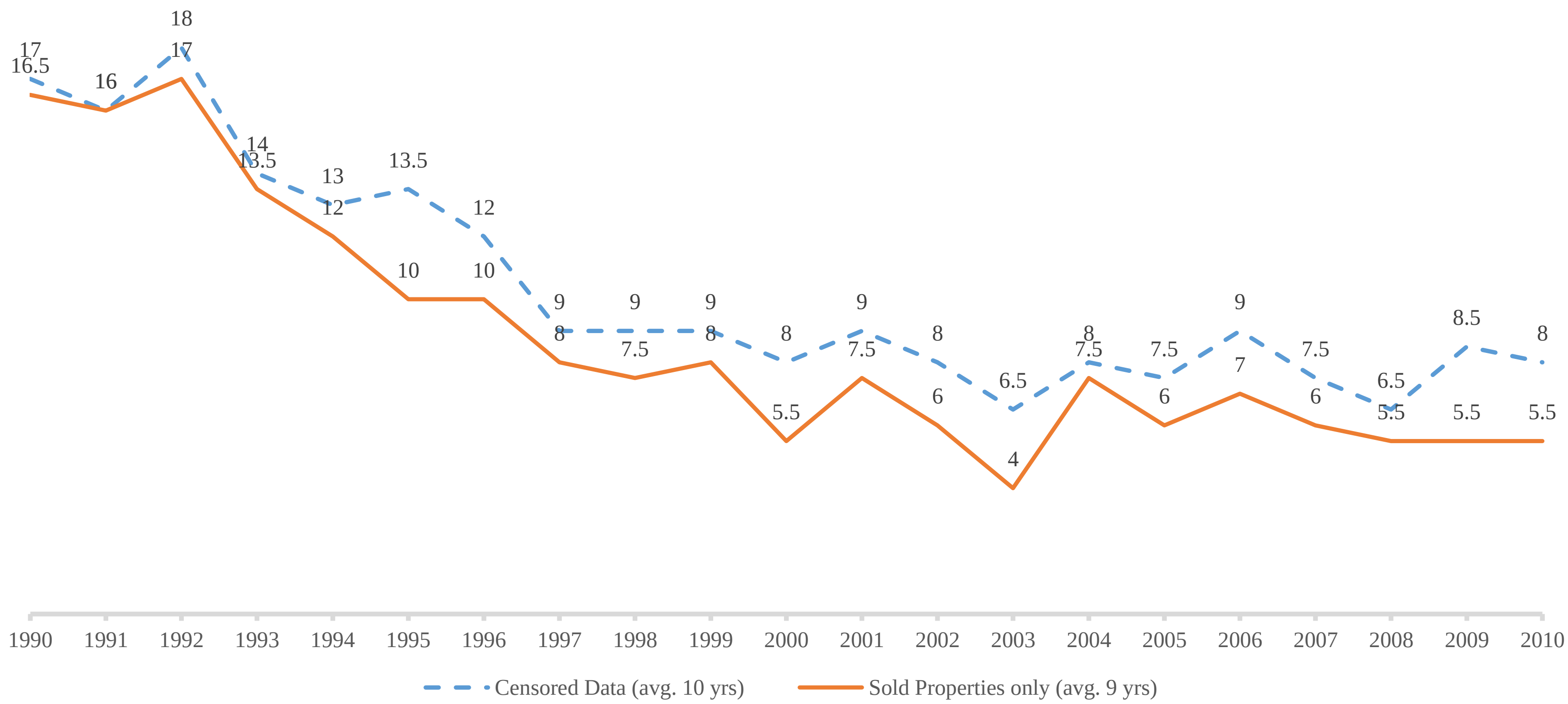
Notes: Variable descriptions are provided in Table 1. The parameters are derived from Accelerated Failure Time (AFT) models.

Figure 1. Implied Holding Period of Hotels across Owner-firm Classification



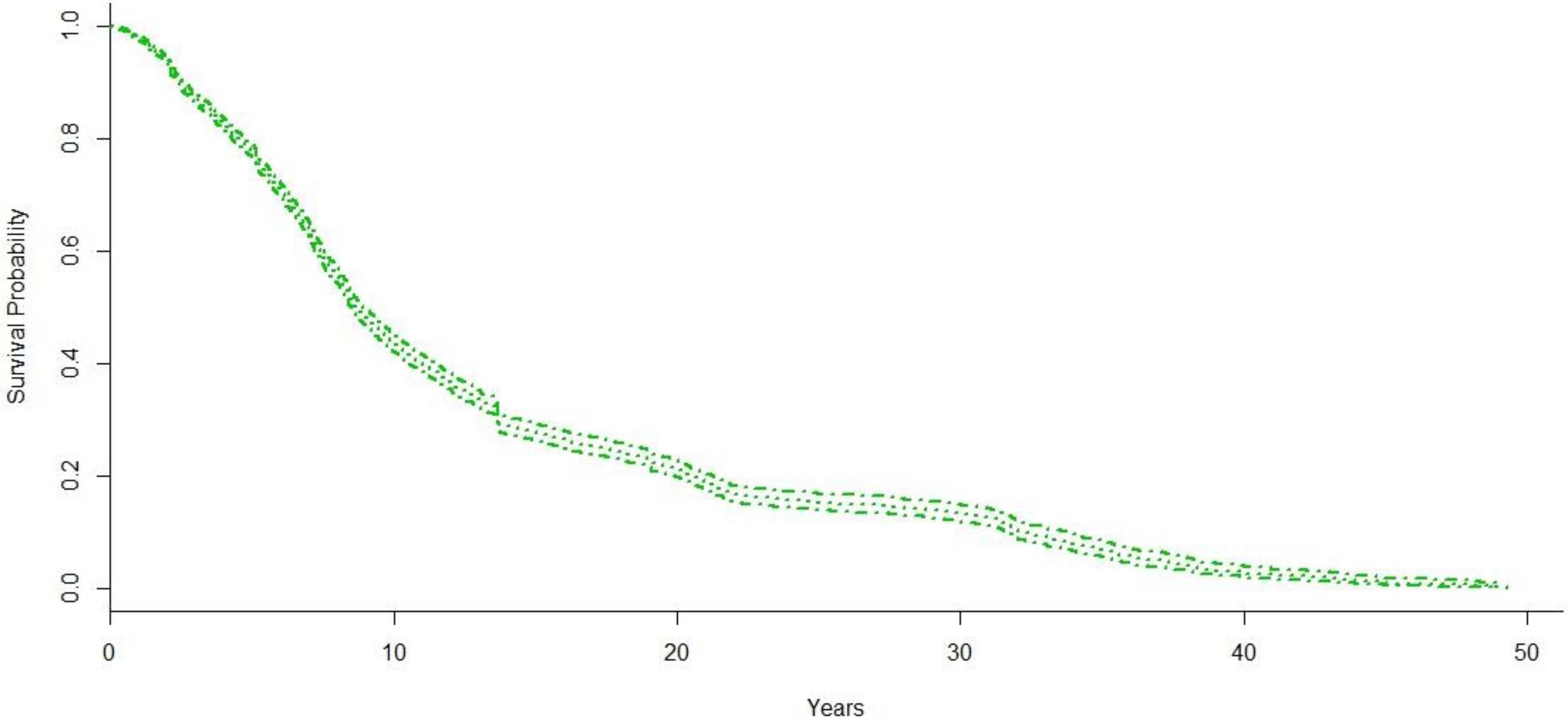
Notes: Y-axis signifies implied holding period. X-axis denotes the year of observation. The implied holding period for a sample of hotel owners is calculated as $\frac{(Prop_t+Prop_{t-1})/2}{Sold_t}$ where *Prop* signifies the number of hotels in the portfolio and *Sold* signifies the number of hotels sold. The subscript t indexes time (in years). This method is based on Atkins & Dyl (1997) and Collett, Lizieri, & Ward (2003). The analysis is based on 290 REITs and REOCs covered by S&P SNL database. REIT and Listed sub-samples are non-exclusive and non-exhaustive with respect to the overall sample.

Figure 2. Observed Holding Period of Sold and Unsold Hotels by their Year of Acquisition



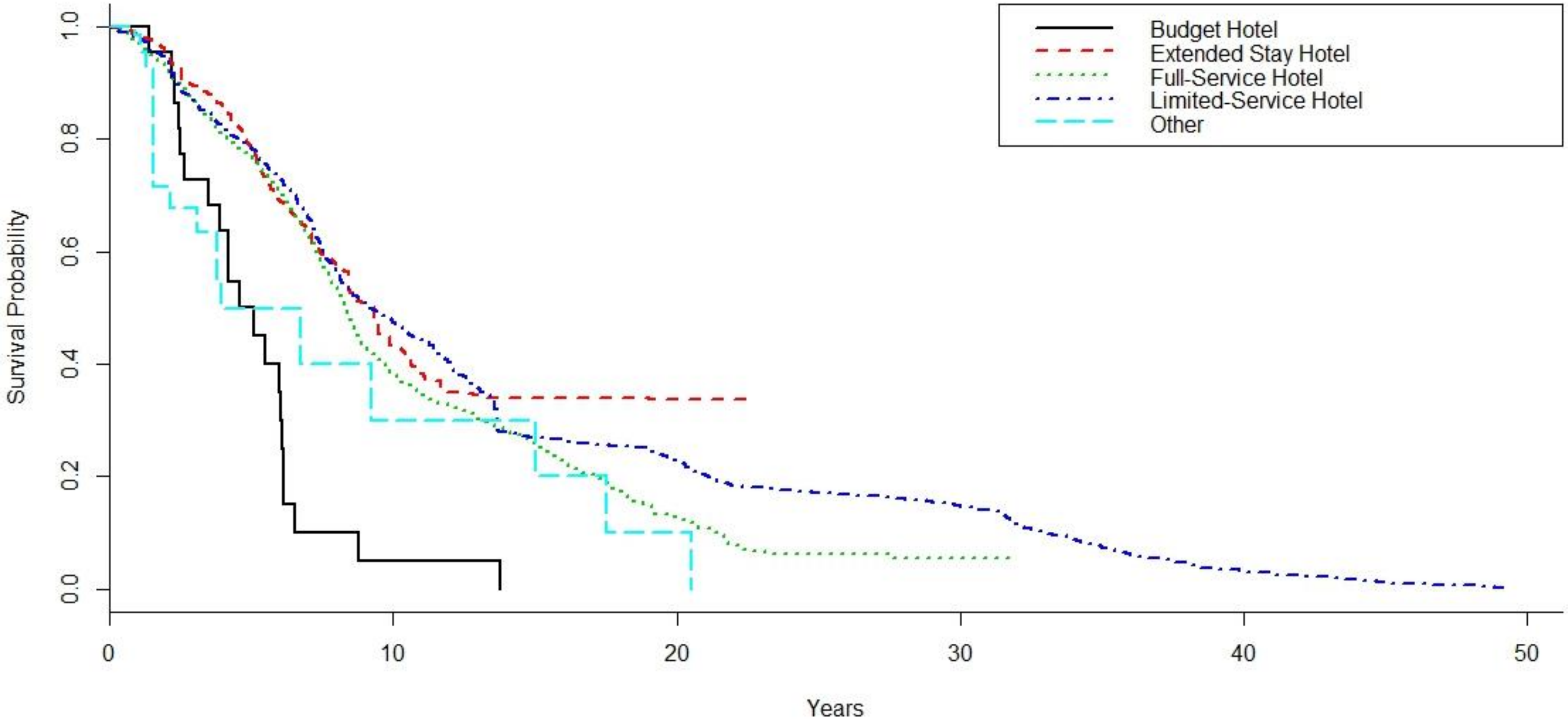
Notes: Y-axis signifies observed holding period. X-axis denotes the year of acquisition. The dotted line (Censored data) includes hotels which were not sold until their most recent observation in the sample. The solid line summarizes the holding period of sold properties. This method is based on Atkins & Dyl (1997) and Collett, Lizieri, & Ward (2003). The analysis is based on 3,239 hotels owned by 290 REITs and REOCs covered by S&P SNL database.

Figure 3. Baseline Survival Function: Full Sample



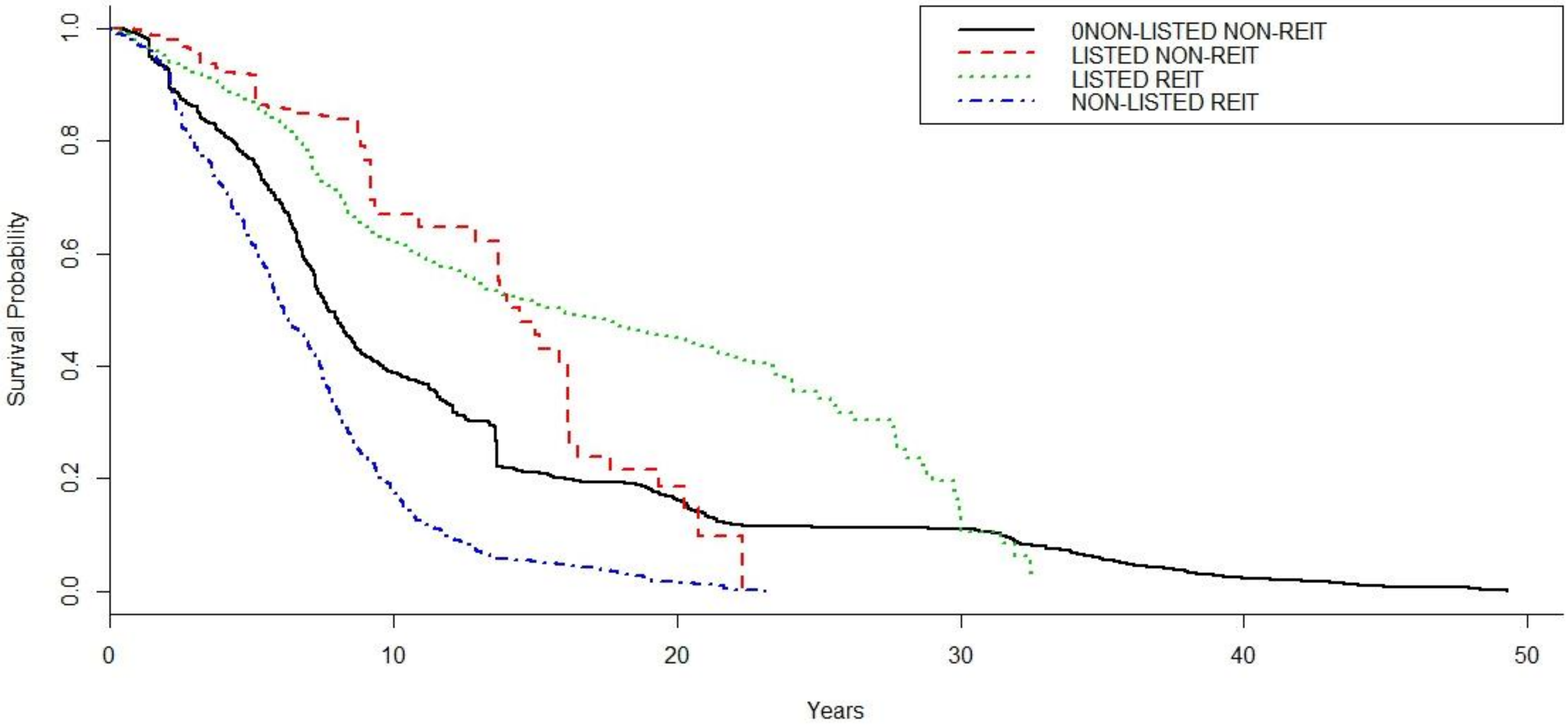
Notes: This figure depicts the Kaplan-Meier Survival Function based on a sample of 6,138 hotels located in the US acquired by REITs and REOCs between 1969 and 2018. 57% of the hotels were sold during the sample period. Sale of an asset denotes a "hazard" and the event of staying unsold is depicted as "survival". X-axis denotes survival duration. Y-axis denotes the cumulative probability of survival until a given duration, if the asset has remained unsold by that duration.

Figure 4. Baseline Survival Function by Property Type Sub-Samples



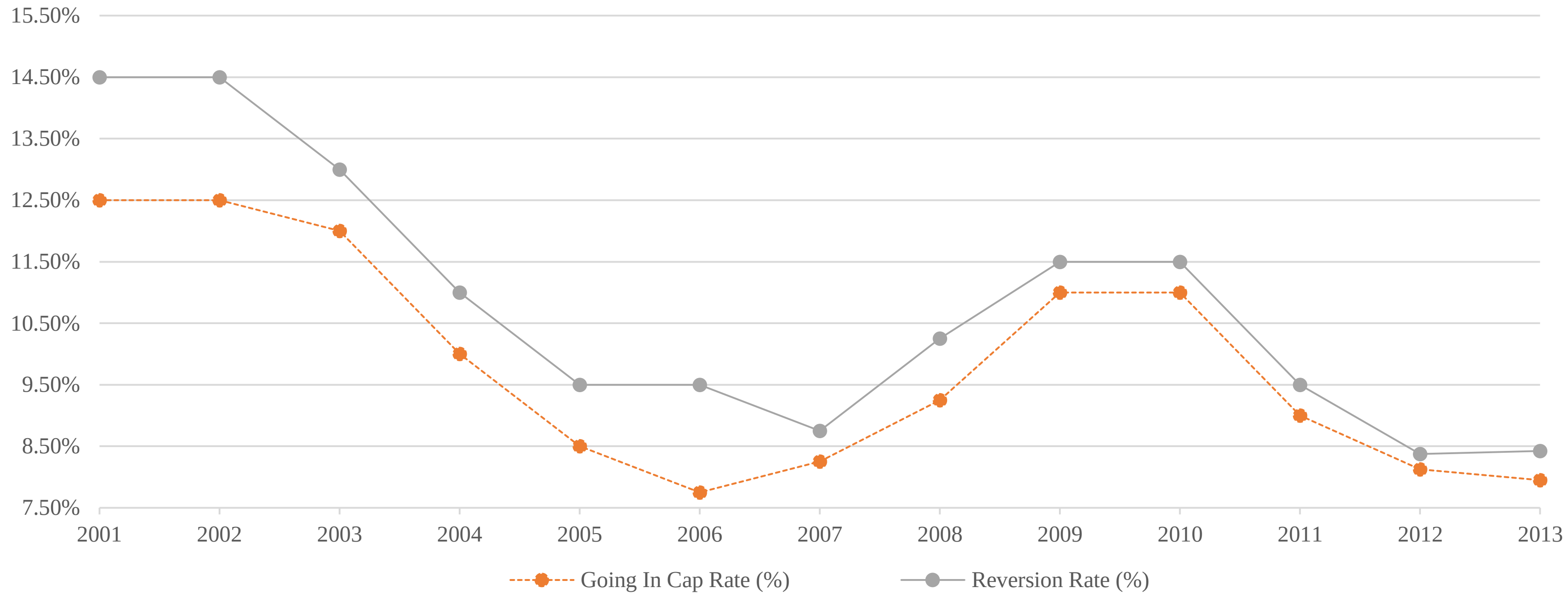
Notes: This figure depicts the Kaplan-Meier Survival Function based on a sample of 6,138 hotels (divided across subsamples) located in the US acquired by REITs and REOCs between 1969 and 2018. 57% of the hotels were sold during the sample period. Sale of an asset denotes a "hazard" and the event of staying unsold is depicted as "survival". X-axis denotes survival duration. Y-axis denotes the cumulative probability of survival until a given duration, if the asset has remained unsold by that duration.

Figure 5. Baseline Survival Function by Owner Type Sub-Samples



Notes: This figure depicts the Kaplan-Meier Survival Function based on a sample of 6,138 hotels (divided across subsamples) located in the US acquired by REITs and REOCs between 1969 and 2018. 57% of the hotels were sold during the sample period. Sale of an asset denotes a "hazard" and the event of staying unsold is depicted as "survival". X-axis denotes survival duration. Y-axis denotes the cumulative probability of survival until a given duration, if the asset has remained unsold by that duration.

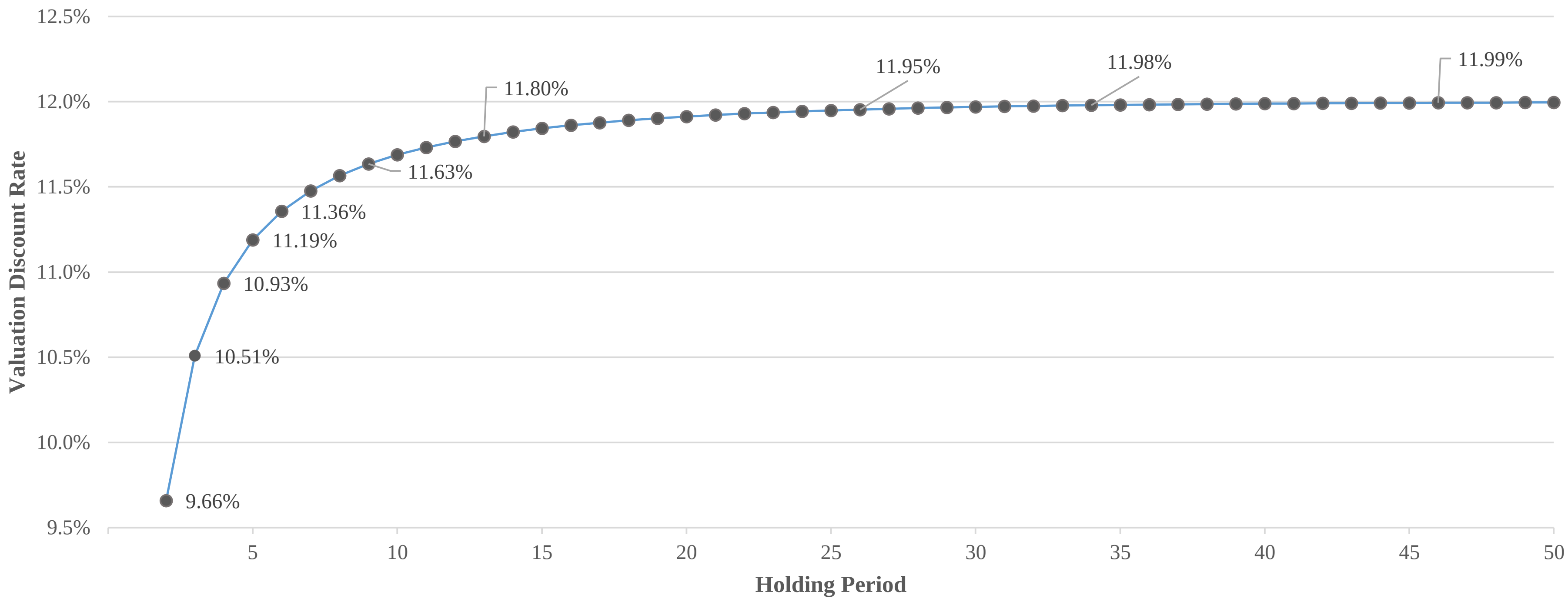
Figure 6. Published Hotel Capitalization Rate Index in Miami-FL



Data Source: Integra Realty Resources

Notes: The graph depicts a representative, proprietary market report for Going-In and Going-Out (“Reversion”) capitalization rates published by Integra Realty Resources (IRR).

Figure 7. Equivalent Discount Rate across Holding Periods



Notes: This hypothetical example shows variations in equivalent discount rates in a DCF valuation exercise which keep the valuation at Year-0 unaltered for a given property across differently assumed holding periods. The stabilized asset acquired at $100 M generates $10 M cash flows in its first year of operation which grows 2% annually rendering the going-in capitalization rate as 10%. The going-out capitalization rate is fixed at 10.5% across all assumed holding periods.

Appendix A. Summary of Hotels Sold and their Holding Period Across US Cities

		Holding Period in Years (if Sold)			
By City	Sold %	Mean	Min	Max	SD
San Antonio	55%	13.8	0.1	48.2	13.9
Seattle	56%	11.1	2.4	31.7	7.4
Austin	37%	10.7	0.6	43.2	11.2
New Orleans	44%	10.3	0.8	19.1	6.4
Philadelphia	46%	9.9	0.6	19.9	5.8
Sacramento	70%	9.9	0.5	48.0	12.8
Denver	51%	9.8	0.6	43.9	11.2
Indianapolis	55%	9.7	0.7	38.2	6.9
Nashville	49%	9.6	1.4	36.0	9.1
Fort Lauderdale	50%	9.5	1.9	30.9	7.1
Chicago	49%	9.1	0.4	18.7	4.4
Miami	52%	8.9	0.7	31.8	7.2
Dallas	60%	8.7	0.0	46.6	9.2
Washington DC	48%	8.7	0.8	17.7	5.3
Columbus	67%	8.7	0.3	38.4	8.0
Las Vegas	63%	8.3	0.2	33.9	7.3
Phoenix	58%	8.1	1.2	44.7	8.9
Tampa	60%	8.1	1.7	39.9	7.1
Birmingham	56%	7.8	0.5	21.7	6.2
San Diego	52%	7.7	0.1	31.1	6.5
Atlanta	57%	7.7	0.8	20.9	4.6
San Francisco	46%	7.5	1.1	19.1	5.6
Orlando	51%	7.4	0.3	31.0	6.7
Jacksonville	49%	7.4	1.8	20.4	5.1
Savannah	61%	7.2	0.7	35.7	9.6
Kansas City	59%	7.2	0.6	21.6	5.1
Arlington	57%	7.2	0.7	20.0	4.5
Houston	60%	6.8	1.2	32.0	4.9
New York	49%	6.7	0.8	18.3	3.7
Fort Worth	56%	5.6	0.8	21.4	4.4

Notes: The table is based on a sample of hotels acquired between 1990 and 2018 in selected US cities as covered by the S&P SNL database. Top 30 cities based on the number of sales recorded are included in the table.

Appendix B. Cox Proportional Hazard Model

t represents a point in the holding period of a hotel and T denotes the survival duration (i.e. time until unsold). $f(t)$ and $F(t)$ are the probability density function (pdf) and cumulative distribution function (cdf) of T such that $\frac{dF(t)}{dt} = f(t)$.

Suppose, $F(t) = P(T<t)$ is the probability that the sale hazard has occurred by the duration t.

Thus, $F(t) = \int_0^t f(x)dx$. Although t is measured on discrete intervals however, we assume it to be a continuous function.

The survival function $S(t)$ denotes the probability that a hotel survived (i.e. was unsold) beyond a duration t.

$$S(t)= P(T\geq t) =1 - F(t) = \int_t^{\infty} f(x)dx$$

which implies that:

$$\frac{dS(t)}{dt} = -f(t)$$

Such baseline survival functions is depicted by Kaplan-Meier curves plots. A hazard function describes the instantaneous probability for the hazard (hotel sale) to occur at age t given the hotel was not sold until then:

$$h_0(t) = \lim_{dt \to o} \frac{P(t \leq T < t+dt \mid T \geq t)}{dx}$$

Given the condition that a hotel remains unsold until the duration t,

$$h_0 (t) =f(t)/S(t).$$

$$\Rightarrow h_0(t)=-\frac{d(S(t))}{S(t)}= -\frac{d}{dt}\{log[S(t)]\}$$

The above equation is the baseline hazard rate model. However, these are non-parametric description of a sample. Applying the Cox Proportional Hazard (CPH) model we can explain the hazard function using covariates (X):

$$h(t \mid X) =h_0(t)e^{\beta X}$$

The non-parametric baseline hazard function (h_0 (t)) need not be specified. The parameters (β) based on the baseline are estimated using partial likelihood estimators. Therefore, the CPH is a semi-parametric proportional hazard model.