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The Use of Fixed-rate and Floating-rate Debt for Hotels

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A time-series simulation that compares hotel-industry revenue per available room (RevPAR) with London Interbank Offer Rate (LIBOR) indicates that hotel investors would fare more favorably with floating-rate loans than with the commonly used fixed-rate financing. Using data from 1987 through 2004, the study determined that LIBOR and RevPAR changes are strongly correlated, indicating a relationship of RevPAR and floating interest rates. Moreover, a simulation found that hotels using variable-rate mortgages would have been more likely to cover debt service in good times and bad than would hotels financed with fixed-rate loans. The correlation was strongest for midscale, limited-service properties but also operated for budget and resort deals. The relationship of RevPAR with floating rates suggests a reduction in the costs to borrowers and lenders arising from distressed loans.

Keywords: hotel financing; fixed-rate and floating-rate mortgages; debt-service coverage; RevPAR

Hotel company CFOs and property-level investors carefully consider decisions regarding the relative proportions of debt and equity that go into capital structures. The financing decision does not end, however, with the determination of the extent of leverage. Other important decisions remain—not the least important of which is whether the interest for that debt should carry fixed or floating rates.[1]

This issue arises largely because hotel properties represent a special category of commercial real estate, the users of which agree to short-term (usually, daily) tenancy, as compared with long-term leases typical of other commercial real estate. The resulting volatility of revenues is a defining characteristic of hotels, a feature cited by investors as the reason that hotel properties are viewed as riskier investments than other types of real estate.[2] Despite their variable cash flows, for hotels—as with most other types of commercial property—long-term, fixed-rate mortgages with constant debt-service payments are the common means of financing.[3] This makes sense with office- and retail-property investments, for example, where the structure

of fixed lease payments is intended to allow the property to generate net operating income of sufficient size to cover debt service. The potential volatility of hotel-property revenues due to occupancy uncertainty, however, may result in a greater number of periods when fixed debt-service payments exceed net operating income, leading to possible delinquency and default.

One way to mitigate this risk might be to contract for variable debt-service payments to align cash outflows with changing revenues. This financing strategy raises obvious questions about how closely payments on floating-rate debt match hotel revenue streams. Indeed, one might expect interest rates and hotel revenues to exhibit a positive relationship. When the economy is strong, the demand for money increases, causing interest rates to increase. That is the same economic environment in which the demand for leisure and business travel increases, causing hotel revenues to increase. Empirical evidence supports this observation regarding the procyclical tendencies of hotel revenues. Wheaton and Rossoff's econometric results suggest that "the demand for hotel-night stays moves closely with U.S. GDP, only modified with a rental rate elasticity of demand."[4]

In this study, we examine the viability of floating-rate, debt-financing strategies by investigating the time-series relationships between London Interbank Offer Rate (LIBOR), the index typically used in floating-rate debt contracts, and revenue per available room (RevPAR). The strong correlations we find from this analysis suggest that hotel investors who match interest payments with hotel revenues by using floating-rate debt (rather than relying on fixed-rate financing) can successfully manage the financial distress of debt.

Why Hotel Owners Should Care about the Fixed- versus Floating-rate Decision

Franco Modigliani and Merton Miller laid the foundation for the study of corporate financing decisions in the 1950s.[5] The Modigliani-Miller theorem, which was largely responsible for both researchers' winning a Nobel Prize in economics, states that if financing choices do not affect the total cash flows that a firm distributes to its debt and equity holders, then financing choices do not affect the total value of a firm's debt and equity. Stated positively, for a firm's financing decisions to have valuation implications, they must affect the total cash flows generated by the firm. Issues relating to managing the costs of financial distress are of particular importance when considering the fixed-rate versus floating-rate financing decision for hotel owners.

It goes without saying that financial distress adversely affects the total cash flows generated by hotels, with losses resulting from default and foreclosure usually spreading to debt holders as well as to equity interests.[6] As too many hotel investors have learned, the direct costs of financial distress include legal fees, court costs, and advisory fees for accountants and investment bankers. In addition to these direct costs, various indirect costs reduce value when a hotel is in financial distress, even if the hotel owner has not filed for bankruptcy. Some examples of these indirect costs are as follows:

- Those without capital invested may fear that the hotel will not be able to make good on its commitments and may alter their actions in ways that adversely affect the hotel. For example, good employees may seek jobs elsewhere and suppliers may tighten their trade-credit terms;

- Hotel management may be distracted from running the business by having to negotiate with lawyers and creditors; and
- Delinquency may cause lenders to exercise more control over operating and financing decisions, thus reducing the value of owners' options.

Given the direct and indirect costs of financial distress, the determination of financing with fixed rates or with floating rates takes on considerable implications for hotel valuation. To maximize value, the objective is to structure interest payments such that any cost of financial distress is minimized. This objective is accomplished by aligning interest payments, to the extent possible, with operating cash flows produced by financed assets. Simply stated, when operating cash flows decline, it is desirous to have interest-payment obligations coincidently decrease, thus mitigating the costs associated with financial distress.

Interest-rate Sensitivity of Hotel Properties and Firms

Recently, Deutsche Bank provided $1.2 billion in debt financing for Strategic Hotel Capital's initial public offering. The company's debt package includes a generous mixture of both fixed-rate and floating-rate debt. Although we do not directly analyze this arrangement, we examine the following related questions: Does this structure expose Strategic Hotel Capital investors to acceptable levels of financial distress? Should hotel firms use more floating-rate debt, or does the reverse structure dominate? and Are hotel owners always wise to lock into fixed-rate mortgages during periods of relatively low interest rates as homeowners often do and to ignore floating-rate financing choices?

Hotel CFOs and investors use floating-rate debt, as the Strategic Hotel Capital example indicates, but no previous studies confirm or refute the argument that hotel revenues and interest rates are closely correlated across market segments and over a variety of alternative time horizons. In this study, we analyze the patterns of LIBOR with those of RevPAR for the United States and for key hotel market segments, locations, and individual properties since 1987. These data are organized in several ways, including comparisons of levels, relative changes, and subperiods to uncover subtle time-series relationships. In the final section of this article, we compare debt-coverage ratios during the study period for fixed-rate and floating-rate financing using cash-flow assumptions for three important business models in the industry: full-service, limited-service, and resort operations.

Data and Methodology

The empirical analysis performed here begins with a detailed examination of the time-series relationships between short-term interest-rate series commonly used in hotel debt financing (i.e., three-month LIBOR) and RevPAR time series for all market segments and location subdivisions reported by Smith Travel Research (STR). Then, we estimate the same time-series relationships using an STR sample of individual hotel properties' RevPARs and LIBOR. We rely heavily on graphical presentations of the time-series data, easy-to-understand statistical methods—primarily Pearson correlation coefficients and *t*-tests—and straightforward simulation exercises to develop conclusions.[7]

All RevPAR data come from STR and possess the characteristics described below.

- *Monthly* observations from the beginning period of the STR time series, January 1987 (1987 M1) through February 2004 (2004 M2).

- *Aggregated* hotel performance information for the United States—for each STR chain scale (i.e., luxury, upper upscale, upscale, midscale with food and beverage, midscale without food and beverage, economy, and independent) and for each of the STR location segments (i.e., urban, suburban, airport, highway, and resort).
- *Disaggregated* hotel performance information for hundreds of hotels within each STR chain scale and location segment.
- *Performance* data during every month, including the number of properties, room revenue, number of rooms available, and number of rooms sold for each chain scale and location segment.

We seasonally adjust RevPARs for this analysis for two reasons. First, seasonal adjustments to RevPARs create monthly time series that match with nonseasonal LIBOR series to provide an objective econometric analysis of the relationships between the two time series. The same type of adjustment would be needed if one of the series contained a trend or drift component. Second, seasonality should not be an issue in this analysis, because hotels' seasonality can be anticipated. Consider the experienced hotel owner who fully understands that the hotel will have seasons when revenues are high and seasons when revenues are low. This hotel owner will make decisions, including financial decisions, based on knowledge of seasonality. Most important, the owner will set money aside during good seasons to cover debt-service obligations during bad seasons. For this reason, seasonality is not consequential to the underlying economic decision regarding the choice of debt. We can also look at the seasonality issue from a delinquency and default perspective. The hotel owner will not become delinquent during bad seasons and then become current during good seasons, while expecting to retain business relationships with lenders. In summary, we are intellectually interested here in the financial decisions of hotel owners through the long-term business cycle and not interested in how they manage short-term cash-flow needs in the presence of highly predictable events.

The analysis must include a deflator, due to the fact that inflation accumulates in RevPAR over time via its average daily rate (ADR) component. Thus, it is appropriate in time-series studies of this type to convert RevPARs from nominal to real terms and thereby put the time series on an equal footing.[8] Although the ADR part of RevPAR picks up inflation as we move through time, neither debt-service time series has this cumulative feature. The fixed-payment debt service is set by contract. The floating-payment debt service is continually reset without a cumulative inflation component. Again, the underlying economics of financial distress over time are the relevant considerations. Specifically, we are interested in the ability of hotel demand and supply conditions at different points in the cycle to provide coverage under alternative financing scenarios.

The Federal Reserve makes data available for several short-term and long-term interest-rate series. Because hotels' debt contracts normally include payment-adjustment provisions based on short-term interest-rate movements, only short-term interest-rate series appear in this study. We perform the analyses with three-month LIBOR, although several interest-rate series were tested. All of the LIBOR series commonly found in hotel debt contracts (i.e., one-month LIBOR, three-month LIBOR, and one-year LIBOR) move in close synchronization with one another, with strong statistical correlations. Exhibit 1 presents descriptions and summary statistics for all RevPAR and interest-rate variables in this study.

Exhibit 1:
Data Descriptions

Variable	*Mean*	*Median*	σ	*Maximum*	*Minimum*
LIBOR	5.39%	5.71%	2.25%	10.31%	1.12%
RUS	$53.30	$53.96	$2.97	$60.89	$45.71
RLUX	$140.75	$138.71	$26.11	$199.82	$103.66
RUU	$92.90	$91.35	$8.22	$111.82	$70.03
RUP	$68.41	$66.75	$5.09	$79.62	$57.76
RMFB	$45.41	$45.75	$2.88	$50.62	$38.81
RMID	$43.25	$43.33	$2.25	$48.04	$39.38
RECO	$30.55	$29.71	$3.26	$38.49	$24.73
RIND	$51.06	$51.41	$2.79	$59.38	$45.71
RURB	$73.79	$72.18	$6.91	$92.36	$59.33
RSUB	$47.09	$47.61	$2.43	$52.66	$41.66
RAIR	$53.92	$54.82	$3.80	$61.79	$45.08
RHW	$38.15	$38.04	$1.72	$42.14	$34.56
RRES	$80.68	$80.13	$4.84	$95.81	$68.61
CLIBOR	–0.08bp	–0.54bp	0.57bp	1.06bp	–1.52bp
CRUS	$0.27	$0.43	$1.47	$3.38	–8.20
CRLUX	$1.30	$2.08	$8.22	$27.34	–$48.21
CRUU	$0.49	$0.86	$4.31	$13.62	–$27.21
CRUP	$0.33	$0.61	$2.12	$4.71	–$12.12
CRMFB	$0.17	$0.31	$1.02	$2.24	–$4.86
CRMID	$0.30	$0.40	$0.82	$2.15	–$3.31
CRECO	$0.04	$0.11	$0.55	$1.23	–$1.07
CRIND	$0.28	$0.38	$1.36	$2.84	–$6.36
CRURB	$0.44	$0.89	$3.19	$9.21	–$19.13
CRSUB	$0.22	$0.39	$1.06	$2.32	–$5.51
CRAIR	$0.23	$0.41	$1.57	$2.73	–$8.82
CRHW	$0.17	$0.26	$0.69	$1.66	–$2.25
CRRES	$0.54	$0.57	$3.00	$7.19	–$15.56

Source: Smith Travel Research and Federal Reserve
Note: This table presents summary statistics for the variables used in this study. LIBOR = Three-month London Interbank Offer Rate; RUS = Revenue per Available Room (RevPAR) U.S. Total; RLUX = RevPAR Luxury Segment; RUU = RevPAR Upper Upscale Segment; RUP = RevPAR Upscale Segment; RMFB = RevPAR Midprice with F&B Segment; RMID = RevPAR Midprice without F&B Segment; RECO = RevPAR Economy Segment; RIND = RevPAR Independent Segment; RURB = RevPAR Urban Location; RSUB = RevPAR Suburban Location; RAIR = RevPAR Airport Location; RHW = RevPAR Highway Location; RRES = RevPAR Resort Location; CLIBOR = Change in LIBOR; CRUS = Change in Revenue Per Available Room (RevPAR) U.S. Total; CRLUX = Change in RevPAR Luxury Segment; CRUU = Change in RevPAR Upper Upscale Segment; CRUP = Change in RevPAR Upscale Segment; CRMFB = Change in RevPAR Midprice with F&B Segment; CRMID = Change in RevPAR Midprice without F&B Segment; CRECO = Change in RevPAR Economy Segment; CRIND = Change in RevPAR Independent Segment; CRURB = Change in RevPAR Urban Location; CRSUB = Change in RevPAR Suburban Location; CRAIR = Change in RevPAR Airport Location; CRHW = Change in RevPAR Highway Location; and CRRES = Change in RevPAR Resort Location. $N = 206$ (months); $n = 67$ (quarters).

Economic Analysis of U.S. Borrowing Rates and RevPAR

As we discussed above, evaluations of the financial performance of hotel markets often begin with assumptions about the close relationships between macroeconomic fluctuations (i.e., the business cycle) and the sales of hotel room nights. It is rea-

sonable therefore to posit a connection between interest rates and hotel revenues, even though connections between the real-estate and financial sectors of the economy are seldom direct. As economic downturns and recoveries occur, the patterns of interest-rate changes and hotel bookings may be unsynchronized because different sets of consumption behavior affect travel decisions and those about borrowing and lending. Any connection between interest rates and hotel-room sales is further clouded by the fact that the determinants of average daily rate and occupancy come in part from the supply side of the market, in which investment considerations dominate, as well as the demand side. Thus, the underlying processes that drive the interest-rate and RevPAR relationship consists of a complicated set of consumption and investment influences. Stated differently, specifying this relationship may not be obvious but should, instead, result from a managed, empirical exercise.

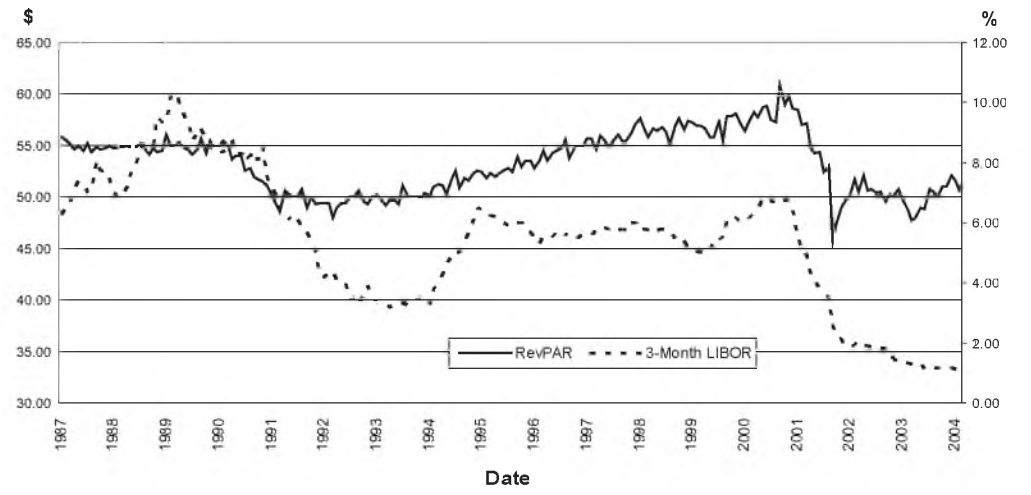
RevPAR and LIBOR Levels

We begin the empirical examination of hotel RevPARs and LIBOR comovement with the graph in Exhibit 2, which shows the time-series pattern of total U.S. RevPAR (adjusted for season and inflation) and three-month LIBOR. Visually, the two series appear to be highly correlated throughout most of the period from 1987 M1 through 2004 M2. The connection seems especially close after 1995 but is not quite as well aligned prior to 1995. During the late 1980s and early 1990s, the hotel markets, along with other commercial property markets, were distorted by legislation that gave favorable tax treatment to real estate and encouraged unsound lending by U.S. Saving and Loan Associations in commercial real estate. Corcorcan and Hendershott and Kane, among others, document the perverse behavior and market disruptions stemming from those legislative actions.[9] One possible explanation for a disconnection between LIBOR and RevPAR during the 1987-through-1995 subperiod and for a closer connection after 1995 is that the full effects of the Savings and Loan crisis and Resolution Trust Corporation's disposal of assets did not entirely clear the hotel markets until 1995. The correlation statistics reported below indicate no differences in the relationship during the early and later subperiods for the STR census of U.S. hotels, but noticeable differences appear for certain hotel market segments and location subdivisions.

Exhibit 3 presents Pearson and Spearman correlation coefficients using monthly data for total U.S., market-segment, and location-segment RevPARs with three-month LIBOR. These statistics appear for the entire study period, the subperiod 1987 M1 through 1994 M12 (subperiod 1), and the subperiod 1995 M1 through 2004 M2 (subperiod 2). Correlations for the U.S. RevPAR and three-month LIBOR are significant at the 0.01 level for the entire study period and for each subperiod. The presence of outliers elevates the coefficients slightly, as indicated by the lower Spearman statistics, although the level of statistical significance remains high regardless of the measure used.

Evaluating the data within subperiods reveals some interesting subtleties in the relationships. While the correlations appear quite high for the entire period, they elevate to noticeably higher numbers when data are separated into subperiods. The likely reason that national RevPAR and LIBOR levels correlate more closely during the shorter intervals than they do during the overall period stems from the fact that the long-term correlations span two quite different cycles, while the short-

Exhibit 2:
Trends in U.S. RevPAR and Three-month LIBOR, 1987 M1–2004 M2



Source: Smith Travel Research and Federal Reserve

term correlations result from data within single cyclical periods. Nevertheless, these correlations remain significant at the 0.01 level for all periods. As additional evidence of short-term correlation differences (not shown), the Pearson statistic increases to 0.93 using data from the period 1999 M1 through 2004 M2.

Most market- and location-segment RevPARs appear highly correlated with LIBOR, particularly during subperiod 2. Negative, significant correlations for the luxury and midscale without F&B segments estimated for the entire study period may be caused by relationships in subperiod 1. Since 1995, all of the RevPARs for segments correlate highly and positively with LIBOR. The inconsistencies in relationships during subperiod 1 compared with the entire sample period and subperiod 2 may be due in part to the market disruptions mentioned earlier but also to the ways in which segments and STR definitions changed over time. The lowest correlations appear for resorts, but resorts' room revenues constitute only about one-half of total revenues, which may account for the relatively lower correlations.

RevPAR-elasticity Estimates and Changes

An understanding of how the levels of RevPAR and LIBOR behave over time helps hotel owners and investors determine the placement proportions of fixed-rate and floating-rate hotel debt. The data presented above indicate a strong tendency for LIBOR and RevPAR to decline in concert. These results suggest that intermediate- and long-term financial distress can be managed with floating-rate contracts. In addition, hotel CFOs and investors should know as much as possible about how period-to-period changes in LIBOR relate to the same period's changes in RevPAR. We approach these questions by analyzing the interest elasticity of RevPAR with respect to LIBOR and the correlations between LIBOR changes and RevPAR changes.

Exhibit 3:
Correlations between Monthly Hotel RevPARs and Three-month LIBOR, 1987 M1–2004 M2 and Subperiods

Hotel RevPAR	Three-month LIBOR					
	1987 M1–2004 M2		1987 M1–1994 M12		1995 M1–2004 M2	
	Pearson	Spearman	Pearson	Spearman	Pearson	Spearman
RUS	.57*	.53*	.80*	.73*	.81*	.68*
RLUX	–.22*	–.32*	–.47*	–.49*	.61*	.50*
RUU	.32*	.37*	.70*	.68*	.80*	.70*
RUP	.25*	.28*	.48*	.23**	.88*	.66*
RMFB	.81*	.78*	.81*	.74*	.90*	.67*
RMID	–.14**	–.17**	–.13	–.09	.77*	.62*
RECO	.85*	.83*	.83*	.76*	.94*	.70*
RIND	.45*	.47*	.83*	.78*	.67*	.57*
RURB	.21*	.26*	.76*	.72*	.67*	.56*
RSUB	.65*	.59*	.77*	.68*	.87*	.69*
RAIR	.65*	.57*	.77*	.69*	.89*	.70*
RHW	.83*	.82*	.79*	.73*	.87*	.67*
RRES	.21*	.20*	.78*	.79*	.50*	.41*

Source: Smith Travel Research and Federal Reserve
Note: This table shows Pearson and Spearman correlations coefficients for U.S. Revenue per Available Room (RevPAR), market-segment RevPARs, and location-segment RevPARs with three-month LIBOR. All data are in levels. The RevPAR data are seasonally adjusted and in real dollars. Correlations are presented for the entire study period 1987 M1–2004 M2 (N = 206), the subperiod 1987 M1–1994 M12 (n = 96), and the subperiod 1995 M1–2004 M2 (n = 110). RUS = RevPAR U.S. Total; RLUX = RevPAR Luxury Segment; RUU = RevPAR Upper Upscale Segment; RUP = RevPAR Upscale Segment; RMFB = RevPAR Midprice with F&B Segment; RMID = RevPAR Midprice without F&B Segment; RECO = RevPAR Economy Segment; RIND = RevPAR Independent Segment; RURB = RevPAR Urban Location; RSUB = RevPAR Suburban Location; RAIR = RevPAR Airport Location; RHW = RevPAR Highway Location; and RRES = RevPAR Resort Location.

RevPAR's Interest Elasticity

The interest-elasticity statistics indicate the percentage change in RevPAR given a percentage change in LIBOR. Thus, these statistics reveal information about the monthly response rate of hotel-room revenue to interest-rate changes. Note that we estimate an empirical response rate, and therefore, no causal relationship between LIBOR and RevPAR is implied.

Exhibit 4 presents monthly interest-elasticity estimates for the same hotel categories previously evaluated. The numbers indicate the interest-inelastic nature of RevPAR at the monthly level of frequency. For all U.S. properties, a 1 percent change in LIBOR corresponds to approximately a 0.10 percent change in RevPAR. Thus, on a percentage basis, monthly RevPAR responds in a modest, statistically significant way to monthly changes in LIBOR.[10] In numerical terms, if LIBOR equals 2.0 percent and RevPAR equals $50 on average, a 10 percent change in LIBOR to 2.2 percent corresponds to a 1 percent change in RevPAR up to $50.50.

The central concern here rests with debt coverage and having sufficient cash flow for rising payments as interest rates increase. The elasticity analysis supports the hypothesis that hotels' incomes change coincidently with changing interest rates. We address the question of whether the changes in income would

Exhibit 4:
Monthly Interest-elasticity Estimates—Hotel RevPARs and Three-month LIBOR, 1987 M1–2004 M2 and Subperiods

	Three-month LIBOR		
Hotel RevPAR	*1987 M1–2004 M2*	*1987 M1–1994 M12*	*1995 M1–2004 M2*
RUS	.06*	.10*	.08*
RLUX	.06*	.09*	.10*
RUU	.06*	.08*	.12*
RUP	.05*	.01	.12*
RMFB	.10*	.12*	.10*
RMID	.00	.01	.04*
RECO	.15*	.21*	.10*
RIND	.04*	.09*	.06*
RURB	.04*	.09*	.09*
RSUB	.06*	.09*	.08*
RAIR	.09*	.11*	.12*
RHW	.06*	.09*	.05*
RRES	.03*	.07*	.04*

Source: Smith Travel Research and Federal Reserve

cover changes in debt-service obligations later in this article.

Quarterly Changes in RevPAR and LIBOR

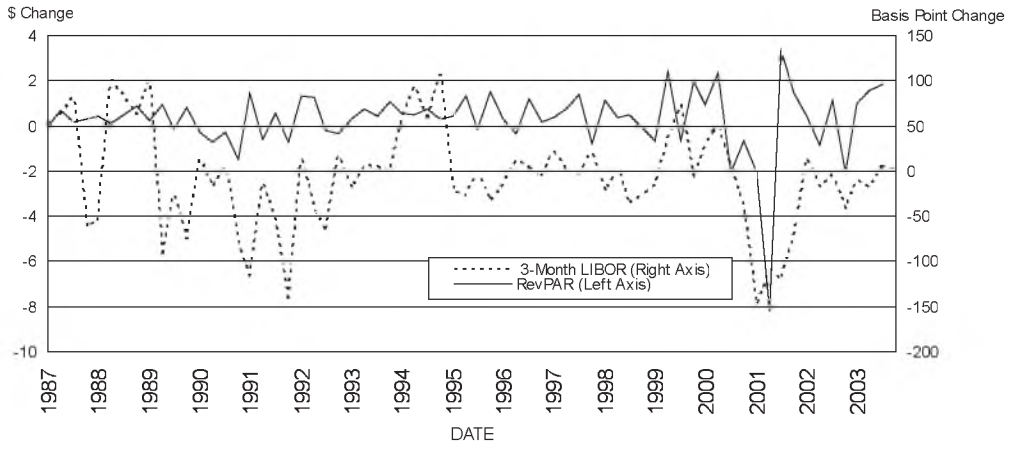
The graphical and correlation analysis that uses levels data since 1987 demonstrates that when hotel RevPARs decline to low levels across all market segments, short-term interest rates also reach low levels. Because period-to-period interest-rate and RevPAR changes have a direct bearing on financial distress associated with debt contracts, we perform a parallel analysis using quarterly changes in LIBOR and hotel RevPAR. Examining quarterly changes avoids the effects of the extreme short-term volatility that are found in monthly changes. In addition, this type of data analysis allows for the use of nominal denominations that correspond directly to collected room revenues.

Exhibits 5 and 6 present graphical and statistical evidence of a close relationship between quarterly changes in LIBOR and RevPAR from 1987 I through 2003 IV. As with the graphical view of the levels data, the quarterly changes align without noticeable leads and lags. Also, the relationship seems particularly strong since 1995. The correlations presented in Exhibit 5 generally confirm these observations. As is usually the case, we observe weaker relationships between changes than between levels, but the correlations are close to the estimates with levels data and show high significance for the entire period and for subperiod 2. For subperiod 1 and for some market segments, though, the results appear weak. Finally, the small differences between Pearson and Spearman measures indicate that the presence of outliers is inconsequential.

Analysis of Individual Property Data

The possibility exists that aggregation of data will bias statistical results. Thus, we obtained data from STR on individual properties' RevPARs and repeated the

Exhibit 5:
Quarterly Changes in Three-month LIBOR and U.S. RevPAR, 1987 I–2003 IV



Source: Smith Travel Research and Federal Reserve

analysis performed on the aggregates. Per our request, STR provided data on all properties for which RevPARs are available for every month within either of the two subperiods studied with the aggregate data (those being 1987 M1–1994 M12 and 1995 M1–2004 M2). Filtering these data involved constructing same-size samples for the two periods. We do not compute correlations for the entire period to limit survivorship bias.

Pearson correlation coefficients appear in Exhibit 7 for all market segments and locations. Note that the samples are of equal sizes for the two subperiods across all segments and locations, but these samples do not consist of the same properties. The total number of properties in each subperiod equals 2,414. The same 2,414 properties are divided first into market segments and then into locations to generate the results in Exhibit 7.

The correlations between individual-property RevPARs and LIBOR closely resemble the correlation findings using RevPAR aggregates. Thus, aggregation bias does not appear to be an issue with our analysis presented above. With the exception of the luxury segment, for which there are only thirteen available observations, we found high percentages of positive, statistically significant correlations. As in the aggregate data analysis, the correlations from the later subperiod universally exceed those from the early subperiod.

A Comparison of Fixed-rate and Floating-rate Debt for Hotels

The significant, positive correlations between RevPAR and LIBOR since 1987 suggest that hotel owners who financed properties with floating-rate debt better aligned debt payments with room revenue than did those who used fixed-rate debt. To assess whether this alignment mitigated financial distress, we present the results of a simulation that tracks how the average hotel owner would have fared by financing with fixed-rate rather than floating-rate debt.

Our examination of financial distress focuses on the debt-coverage ratio (DCR), which is net operating income after the Furniture, Fixture, and Equipment (FF&E)

Exhibit 6:
Correlations between Quarterly Difference in Hotel RevPARs and Three-month LIBOR, 1987 M1–2004 M2 and Subperiods

	Three-month LIBOR					
Hotel	*1987 Q1–2003 Q4*		*1987 Q1–1994 Q4*		*1995 Q1–2003 Q4*	
RevPAR	*Pearson*	*Spearman*	*Pearson*	*Spearman*	*Pearson*	*Spearman*
CRUS	.35*	.28**	.28	.23	.52*	.42**
CRLUX	.25**	.15	.13	.03	.42**	.35**
CRUU	.27**	.16	.15	.03	.43*	.39**
CRUP	.25**	.09	.05	.01	.44*	.26
CRMFB	.37*	.30**	.26	.26	.55*	.39**
CRMID	.22	.16	.15	.11	.33	.27
CRECO	.32*	.35*	.20	.24	.49*	.49*
CRIND	.42*	.38*	.31	.29	.63*	.56*
CRURB	.28**	.18	.17	.13	.45*	.32
CRSUB	.36*	.28**	.31	.21	.51*	.39**
CRAIR	.34*	.16	.14	.00	.56*	.40**
CRHW	.32*	.28**	.30	.32	.42*	.35**
CRRES	.35*	.28**	.15	.11	.58*	.52*

Source: Smith Travel Research and Federal Reserve
Note: This table presents Pearson and Spearman correlation coefficients for U.S. Revenue per Available Room (RevPAR), market-segment RevPARs, and location-segment RevPARs against three-month LIBOR. The RevPAR data are nominal. Correlation coefficients are for quarterly differences in RevPAR (seasonally adjusted) with LIBOR differences and appear for the entire study period 1987 Q1–2003 Q4 (n = 67), the subperiod 1987 Q1–1994 Q4 (n = 31), and the subperiod 1995 Q1–2003 Q4 (n = 36). CRUS = Change in RevPAR U.S. Total; CRLUX = Change in RevPAR Luxury Segment; CRUU = Change in RevPAR Upper Upscale Segment; CRUP = Change in RevPAR Upscale Segment; CRMFB = Change in RevPAR Midprice with F&B Segment; CRMID = Change in RevPAR Midprice without F&B Segment; CRECO = Change in RevPAR Economy Segment; CRIND = Change in RevPAR Independent Segment; CRURB = Change in RevPAR Urban Location; CRSUB = Change in RevPAR Suburban Location; CRAIR = Change in RevPAR Airport Location; CRHW = Change in RevPAR Highway Location; and CRRES = Change in RevPAR Resort Location.
* Significant at .01. ** Significant at .05.

reserve is divided by debt payments. The DCR indicates the level of operating income that a hotel generates for every dollar that its owners are obligated to pay lenders. The lower the DCR, the less ability owners have to meet contractual debt payments and, thus, the greater the potential for financial distress.

Hotel Mortgage-simulation Methodology

The simulation exercise performed here incorporates three different hotel types: limited-service hotels, full-service hotels, and resorts.[11] The first mortgage-origination date in the simulation is January 1, 1987, with subsequent origination dates of January 1 of each year through 1999. This yields thirteen different loan-origination dates for each of the three types of hotels.

For each origination date and hotel type, we compare pairs of mortgages that are identical in all respects except for interest-rate terms, such that one mortgage in the pair carries a fixed rate and the other a floating rate. The mortgage terms used in the simulation are typical for hotel properties as follows:

- We compute fixed-rate payments using the prevailing market rate for hotel

Exhibit 7:
Correlations between Individual Property RevPAR and LIBOR, by Segment and Subperiod

	H_A: Correlation > 0				
			% Statistical		
Segment	Number of Hotels	% Positively Correlated	Significant at 10%	Significant at 5%	Significant at 1%
Panel A: Pearson correlation coefficients, 1987 M1–1994 M12					
RLUX	13	30.77	23.08	7.69	7.69
RUU	398	80.40	71.61	69.85	63.82
RUP	163	63.80	56.44	50.92	44.17
RMFB	839	68.18	56.02	51.49	44.70
RMID	321	61.37	50.16	47.04	41.43
RECO	431	71.23	60.32	57.77	51.51
RIND	249	56.22	39.36	36.55	33.33
Total/average	2,414	61.71	51.00	45.90	40.95
RURB	356	55.90	42.13	38.76	30.62
RSUB	845	67.46	57.16	52.66	45.68
RAIR	347	62.25	49.86	46.97	42.65
RHW	696	63.99	53.74	50.57	44.54
RRES	170	62.94	45.29	41.18	32.35
Total/average	2,414	62.51	49.64	46.03	39.17
Panel B: Pearson correlation coefficients, 1995 M1–2004 M2					
RLUX	13	69.23	53.85	53.85	53.85
RUU	398	74.12	65.58	63.07	57.54
RUP	163	90.80	87.73	84.05	81.60
RMFB	839	72.47	60.19	57.21	50.06
RMID	321	84.11	78.82	74.77	67.60
RECO	431	77.49	66.59	63.34	57.08
RIND	249	72.69	59.84	56.22	50.20
Total/average	2,414	77.27	67.51	64.64	59.70
RURB	356	71.07	59.55	56.74	49.72
RSUB	845	82.01	74.32	71.60	66.86
RAIR	347	77.81	71.47	70.32	65.13
RHW	696	78.74	69.25	66.67	61.35
RRES	170	74.71	61.18	57.65	50.00
Total/average	2,414	76.87	67.15	64.60	58.61

Source: Smith Travel Research and Federal Reserve
Note: This table presents Pearson correlation coefficients for Revenue per Available Room (RevPAR) from thousands of properties and for LIBOR by hotel market segment and two subperiods. Subperiods are used in the analysis to limit survivorship bias. RLUX = RevPAR Luxury Segment; RUU = RevPAR Upper Upscale Segment; RUP = RevPAR Upscale Segment; RMFB = RevPAR Midprice with F&B Segment; RMID = RevPAR Midprice without F&B Segment; RECO = RevPAR Economy Segment; RIND = RevPAR Independent Segment; RURB = RevPAR Urban Location; RSUB = RevPAR Suburban Location; RAIR = RevPAR Airport Location; RHW = RevPAR Highway Location; and RRES = RevPAR Resort Location.

mortgages at the time of loan origination. Fixed-rate data for hotel mortgages come from the American Council of Life Insurers (ACLI).

- A resetting of floating-rate payments occurs every January based on the prevailing three-month LIBOR plus a margin. For loans originated in January 1996 and thereafter, the margin equals the prevailing market margin for floating-rate hotel mortgages at the time of loan origination. For loans originated in January 1995 and earlier, we estimated the margin each year using the contemporaneous spread between rates on fixed-rate hotel mortgages and ten-year U.S. Treasury notes.[12] Floating-rate margin data are from the ACLI, and LIBOR data come from the Federal Reserve.
- We base payments on an assumed twenty-five-year amortization schedule, with a balloon payment after five years.
- Principal balances at origination are based on a loan-to-value (LTV) ratio of 67.1 percent, which is the average LTV ratio over the study period, computed with ACLI data. We also use alternative LTVs of 1,000 and 2,000 basis points greater than the average (i.e., 77.1 percent and 87.1 percent) in the simulation for comparison purposes.
- Hotel valuations are calculated as

$$\frac{\text{NET OPERATING INCOME} - \text{FF\&E RESERVE}}{\text{CAPITALIZATION RATE}},$$

where net operating income is computed using the mortgage-origination-year RevPAR; percentage of revenues is derived from other revenues, such as food and beverage; and profit margin. STR is the source of all RevPAR data. Historical information about other-revenues percentages and profit margins comes from the Hospitality Research Group of PKF Consulting. By assumption, the FF&E reserve equals 5 percent of total hotel revenues. Capitalization rates exactly align with the prevailing market-capitalization rates used in hotel valuations at the time of mortgage origination. Capitalization-rate data come from the Real Estate Research Corporation surveys.

Debt-coverage Methodology

For all mortgages, we compute the DCR during each year of a mortgage's five-year life. This produces a total of sixty-five yearly debt-coverage observations, for each combination of fixed- or floating-rate mortgage, LTV ratio (i.e., 67.1, 77.1, or 87.1 percent), and hotel type (i.e., limited service, full service, or resort).[13] Then, for each combination of mortgage-interest-rate type, LTV, and hotel type, we calculate how frequently the DCR falls below the threshold range of 1.00 to 1.50.[14]

Debt-coverage Results, 1987 to 2004

Debt-coverage results for the simulated loans appear in Exhibit 8. The more often the DCR falls below the debt-coverage threshold, the greater the potential for financial distress. Industry data indicate that the approximate long-term range for DCRs is 1.38 through 1.53.[15] To focus the discussion, assume that a DCR of less than 1.40 triggers concerns about the financial viability of the hotel. Panel A of Exhibit 8 shows that limited-service hotel owners who financed with fixed-rate mortgages at a 67.1 percent LTV would have experienced a sub-1.40 DCR 12.31 percent of the time versus 6.15 percent of the time for those who financed with floating-rate mortgages, a difference that suggests that floating-rate mortgages mitigated financial distress. For the limited-service segment, the benefits of choosing floating-rate mortgages are greater for owners who were more aggressive (i.e., chose a higher LTV) in financing their properties. The frequency differential equals 18.46 percentage points for a 77.1 percent LTV and 26.15 percentage points for an 87.1 percent LTV.

Panel B shows that the floating-rate mortgage benefits of reduced financial

Exhibit 8:
Simulated Hotel Mortgage Analysis

	67.1% LTV			77.1% LTV			87.1% LTV		
DCR	Fixed (%)	Floating (%)	Difference (%)	Fixed (%)	Floating (%)	Difference (%)	Fixed (%)	Floating (%)	Difference (%)
Panel A: Limited service									
< 1.00	0.00	0.00	0.00	1.54	0.00	–1.54	6.15	4.62	–1.54
< 1.10	1.54	0.00	–1.54	4.62	3.08	–1.54	13.85	7.69	–6.15
< 1.20	3.08	1.54	–1.54	9.23	6.15	–3.08	30.77	16.92	–13.85
< 1.30	6.15	4.62	–1.54	23.08	13.85	–9.23	52.31	23.08	–29.23
< 1.40	12.31	6.15	–6.15	38.46	20.00	–18.46	69.23	43.08	–26.15
< 1.50	23.08	15.38	–7.69	58.46	29.23	–29.23	86.15	58.46	–27.69
Panel B: Full service									
< 1.00	9.23	6.15	-3.08	9.23	6.15	–3.08	15.38	9.23	–6.15
< 1.10	9.23	6.15	–3.08	12.31	7.69	–4.62	29.23	16.92	–12.31
< 1.20	10.77	6.15	–4.62	24.62	15.38	–9.23	49.23	24.62	–24.62
< 1.30	15.38	9.23	–6.15	43.08	21.54	–21.54	61.54	26.15	–35.38
< 1.40	29.23	15.38	–13.85	53.85	24.62	–29.23	73.85	32.31	–41.54
< 1.50	43.08	21.54	–21.54	67.69	30.77	–36.92	81.54	43.08	–38.46
Panel C: Resort									
< 1.00	1.54	0.00	–1.54	6.15	1.54	–4.62	15.38	10.77	–4.62
< 1.10	3.08	0.00	–3.08	12.31	9.23	–3.08	29.23	18.46	–10.77
< 1.20	10.77	3.08	–7.69	29.23	16.92	–12.31	41.54	29.23	–12.31
< 1.30	15.38	10.77	–4.62	33.85	23.08	–10.77	52.31	32.31	–20.00
< 1.40	29.23	18.46	–10.77	43.08	29.23	–13.85	70.77	36.92	–33.85
< 1.50	33.85	23.08	–10.77	56.92	33.85	–23.08	81.54	41.54	–40.00

Source: American Council of Life Insurance, Federal Reserve, Hospitality Research Group of PKF Consulting, Real Estate Research Corporation, and Smith Travel Research

Note: This table presents results from the hotel mortgage simulation based on data from 1987 through 2003. The table shows how frequently the debt-coverage ratio (DCR) was below thresholds ranging from 1.00 to 1.50 with fixed-rate and floating-rate mortgages for a given loan-to-value ratio (LTV; 67.1, 77.1, or 87.1 percent) and hotel business (limited service, full service, or resort). This frequency calculation is made by dividing the number of DCR observations that were below the threshold by the total of sixty-five DCR observations. Panel A presents results for limited-service hotels, Panel B for full-service hotels, and Panel C for resorts.

distress were even greater for full-service hotel owners than for owners of limited-service properties. The frequency differential equals 13.85 percentage points for a 67.1 percent LTV, 29.23 percentage points for a 77.1 percent LTV, and 41.54 percentage points for an 87.1 percent LTV. Panel C shows the same pattern of reduced financial distress for resort owners who financed properties with floating-rate mortgages. The frequency differential equals 10.77 percentage points for a 67.1 percent LTV, 13.85 percentage points for a 77.1 percent LTV, and 33.85 percentage points for an 87.1 percent LTV.

An inspection of DCR thresholds above and below 1.40 tells the same story of reduced financial distress for hotel owners who financed properties with floating-rate mortgages. For every DCR threshold and every hotel business, the frequency of financial distress for floating-rate financing was less than or equal to the frequency for fixed-rate arrangements.

Thus, we conclude that the DCR results from the simulation experiment show that the positive relationship between RevPAR and LIBOR translates into mitigated financial distress for hotel owners who finance with floating-rate debt. When hotel-operating cash flows decline, debt payments also decline, thus mitigating financial distress.

Debt-coverage Results during Periods of Increasing Interest Rates

The United States experienced a long-run downward trend in interest rates during the study period 1987 M1 through 2004 M2. We wanted to determine whether the relationships that we found would hold with an upward interest-rate trend. A close examination of Exhibits 2 and 5 shows coincidental movement of the two series both upward and downward. While the periods of coincidental upward movement are too few in number to enable a time-series correlation analysis, we augmented the simulation to focus on the five-year periods when interest rates increased, namely, 1987 to 1991, 1992 to 1996, 1993 to 1997, 1994 to 1998, and 1996 to 2000. The mean increase in LIBOR for these periods equals 1.32 percent, and the median increase was 1.41 percent. We executed the same simulation as described above for these five periods. The results, shown in Exhibit 9, reveal similar advantages from floating-rate debt structures. In almost every scenario, the floating-rate structure exposes borrowers to less financial distress than does the fixed-rate alternative.

Summary and Conclusion

Motivation for this study comes from the desire to analyze debt structures and thus enable hotel investors to minimize the costs of financial distress by successfully matching debt-service obligations with cash flow. In the case of hotels, investors may believe that revenues and net operating incomes have a positive (i.e., procyclical) relationship with interest rates, and thus, floating-rate debt stands as a viable alternative. Yet investors could become hesitant to aggressively finance hotels with floating-rate structures because (1) the relationship between hotel incomes and interest rates periodically may be disturbed by the complicating influences of consumption decisions on the demand side and investment decisions on the supply side of the underlying markets, and (2) no empirical studies exist to confirm or refute the argument that hotel income and interest rates have a long-run stable and positive relation.

The results that we reported here demonstrate that hotel revenues and LIBOR have been highly and significantly correlated since 1987 and especially so since 1995. Correlations of monthly levels and quarterly changes are consistently strong across nearly all market segments and locations. A simulation comparing fixed-rate loans and floating-rate loans demonstrates that the costs of financial distress can be most effectively managed with floating-rate debt, based on the best available historical information. These results affirmatively answer the central questions about the strength and stability of the relationship, but questions remain about how investors might use this information.

Paramount among the remaining questions is one of determining the best mix of fixed rates and floating rates for financing hotel investments.[16] While finding the optimal mix of payment structures was not a direct target of this study, our results provide some guidance. If financing choices can be considered as a continuum, at the extreme left on this continuum is 100 percent fixed-rate debt and on the extreme

Exhibit 9:
Simulated Hotel Mortgage Analysis

	67.1% LTV			77.1% LTV			87.1% LTV		
DCR	Fixed (%)	Floating (%)	Difference (%)	Fixed (%)	Floating (%)	Difference (%)	Fixed (%)	Floating (%)	Difference (%)
Panel A: Limited service									
< 1.00	0.00	0.00	0.00	4.00	0.00	−4.00	12.00	8.00	−4.00
< 1.10	4.00	0.00	−4.00	8.00	4.00	−4.00	20.00	12.00	−8.00
< 1.20	4.00	4.00	0.00	16.00	8.00	−8.00	36.00	24.00	−12.00
< 1.30	12.00	8.00	−4.00	32.00	20.00	−12.00	48.00	28.00	−20.00
< 1.40	20.00	8.00	−12.00	40.00	24.00	−16.00	60.00	40.00	−20.00
< 1.50	32.00	24.00	−8.00	52.00	36.00	−16.00	80.00	64.00	16.00
Panel B: Full service									
< 1.00	12.00	4.00	−8.00	12.00	4.00	−8.00	16.00	8.00	−8.00
< 1.10	12.00	4.00	−8.00	16.00	4.00	−12.00	20.00	16.00	−4.00
< 1.20	12.00	4.00	−8.00	20.00	12.00	−8.00	28.00	28.00	0.00
< 1.30	16.00	8.00	−8.00	28.00	20.00	−8.00	40.00	28.00	−12.00
< 1.40	20.00	12.00	−8.00	28.00	28.00	0.00	64.00	44.00	−20.00
< 1.50	28.00	20.00	−8.00	52.00	40.00	−12.00	72.00	44.00	−28.00
Panel C: Resort									
< 1.00	4.00	0.00	−4.00	12.00	4.00	−8.00	24.00	20.00	−4.00
< 1.10	8.00	0.00	−8.00	24.00	16.00	−8.00	36.00	24.00	−12.00
< 1.20	20.00	8.00	−12.00	36.00	24.00	−12.00	44.00	40.00	−4.00
< 1.30	24.00	20.00	−4.00	40.00	28.00	−12.00	52.00	40.00	−12.00
< 1.40	36.00	24.00	−12.00	44.00	40.00	−4.00	60.00	52.00	−8.00
< 1.50	40.00	28.00	−12.00	52.00	44.00	−8.00	76.00	60.00	−16.00

Source: American Council of Life Insurance, Federal Reserve, Hospitality Research Group of PKF Consulting, Real Estate Research Corporation, and Smith Travel Research

Note: This table presents results from the hotel mortgage simulation for five-year periods between 1987 and 2003 that were characterized by increasing LIBOR: specifically, 1987 to 1991, 1992 to 1997, 1993 to 1998, 1994 to 1999, and 1996 to 2001. The table shows how frequently the debt-coverage ratio (DCR) was below thresholds ranging from 1.00 to 1.50 with fixed-rate and floating-rate mortgages for a given loan-to-value ratio (LTV; 67.1, 77.1, or 87.1 percent) and hotel business (limited service, full service, or resort). This frequency calculation is made by dividing the number of DCR observations that were below the threshold by the total of twenty-five DCR observations. Panel A presents results for limited-service hotels, Panel B for full-service hotels, and Panel C for resorts.

right is 100 percent floating-rate financing. Real-estate investors may be tempted to begin on the left end with entirely fixed-rate debt then move to the right by substituting floating-rate debt as relative terms and risks indicate. Given the fixed-income patterns associated with leased properties, this approach appears logical for office, retail, apartments, and industrial-real-estate financing. The absence of leases suggests the opposite approach for hotel finance, beginning hotel debt-financing arrangements with 100 percent floating-rate debt and then adding fixed-rate debt as conditions dictate. The most obvious conditions for this substitution to occur are when leased components, such as retail, contribute measurably to total property income.

Another remaining question is whether hotel owners are wise to lock into fixed-rate debt during periods of relatively low

interest rates. In the absence of profitable arbitrage opportunities, the long-term rate represents an average of the current short-term rate and expected future short-term rates. When long-term rates are relatively low, participants in the financial markets expect that future short-term rates will also be relatively low. The implication is that hotel owners, on average, will not pay a lower average rate by taking out a fixed-rate loan over a floating-rate loan.[17] Empirical evidence supports this claim, showing that corporate managers do not exhibit an ability to time their debt issues to take advantage of low rates.[18] Unless the hotel owner knows more about the direction of future interest rates than others in the credit markets, then trying to lock in a fixed rate at the bottom of the market is futile. Rather than try to market-time interest rates, hotel owners' efforts are better spent trying to manage financial distress by aligning operating cash flows and debt-service obligations. Our study suggests that hotel owners can best achieve this alignment through floating-rate debt as opposed to fixed-rate debt.

Endnotes

1. Floating-rate financing is generally available to hotel borrowers today. A recent analysis by Morgan Stanley documents the widespread use of floating-rate loans in commercial mortgaged-backed securities (CMBS) issues, which constitute 16 percent of the total involve hotel mortgages. See Morgan Stanley, *Floating Rate Large Loan CMBS*, Fixed Income Research, October 6, 2004. See also Fitch Ratings, "Rating Floating-rate Commercial Mortgage Transactions," *Structured Finance*, December 1, 1999.
2. For discussions, see Joseph A. Ismail, Michael C. Dalbor, and Juline E. Mills, "Using RevPAR to Analyze Lodging-segment Variability," *Cornell Hotel and Restaurant Administration Quarterly* 43, no. 6 (December 2002): 73–80; and Daniel C. Quan, Jei Li, and Ankur Sehgal, "The Performance of Lodging Properties in an Investment Portfolio," *Cornell Hotel and Restaurant Administration Quarterly* 43, no. 6 (December 2002): 81–89.
3. Daily e-mail news services operated by various firms including Smith Travel Research, Hotel Business, and Hotels report on a regular basis the details of hotel financing transactions. Our reading of these news reports (copies available on request) during the past year indicates that the majority of transactions involve fixed-rate financing. Since 2000, the American Council of Life Insurers (ACLI) has recorded the number of floating-rate loans by property type. During 2003, ACLI members made forty-five hotel loans, thirteen of which involved floating-rate payments. See American Council of Life Insurance, *Investment Bulletin* (2003).
4. William C. Wheaton and Lawrence Rossoff, "The Cyclic Behavior of the U.S. Lodging Industry," *Real Estate Economics* 26, no. 1 (1998): 67. See also Jeong-Gil Choi, Michael D. Olsen, Francis A. Kwansa, and Eliza Ching-Yick Tse, "Forecasting Industry Turning Points: The U.S. Hotel Industry Cycle Model," *International Journal of Hospitality Management* 18 (1999): 159–70.
5. Franco Modigliani and Merton Miller, "The Cost of Capital, Corporation Finance, and the Theory of Investment," *American Economic Review* 48 (June 1958): 261–95.
6. Hotels have the second-highest default rates among commercial property types, after health-care properties, and the third-highest loan-loss severity, behind health-care and manufactured housing. See Brian P. Lancaster and Davis J. Cable, "CMBS: Impressive Performance," *Real Estate Finance Journal* (Spring 2004): 5–21, which estimates the default rate at 7.2 percent and loss severity at 48.2 percent for CMBS hotel loans from 1992 through 2002. In contrast, the average default rate for all property types equals 2.4 percent and the average loss severity equals 41.9 percent.
7. Although we do not use them here, advanced econometric methods for time-series analysis, such as cointegration and vector error correction modeling, often appear in academic research. For a straightforward presentation of those methods, see Peter Kennedy, *A Guide to Econometrics*, 4th ed. (Boston: MIT Press, 1998), chap. 17.
8. Seasonal adjustment is accomplished with the Statistical Analysis System version of the U.S. Bureau of the Census X11 procedure. The Consumer Price Index is used for inflation adjustment.

9. Patrick Corcoran, "Explaining the Commercial Real Estate Market," *Journal of Portfolio Management* 13 (Spring 1987): 15–21; and Patrick Hendershott and Edward Kane, "Causes and Consequences of the 1980s Commercial-construction Boom," *Journal of Applied Corporate Finance* 5 (June 1992): 61–70.
10. We computed elasticity numbers using quarterly data and found nearly identical outcomes (not shown). The ability to repeat this analysis using annual data is limited by the low number of observations.
11. Limited-service hotels comprise a room-weighted combination of midscale hotels without food and beverage and economy hotels. Full-service hotels are composed of a room-weighted combination of luxury hotels, upper upscale hotels, and midscale hotels with food and beverage.
12. Floating-rate margin data for hotel mortgages prior to the first quarter of 1996, to our knowledge, are not available. To estimate the margin for floating-rate mortgages originated in January 1995 and earlier, we first calculate the spread between rates on fixed-rate hotel mortgages and ten-year Treasury notes from the first quarter of 1996 through the fourth quarter of 2003. We then calculate the median difference between this fixed-rate spread and the floating-rate margin for the same period. For each year from 1987 to 1995, we add this difference to the prevailing fixed-rate spread to obtain an estimate of the margin for floating-rate mortgages.
13. The total of 115 yearly debt-coverage observations was obtained as follows. Loans originated in 1987 through 1994 yield 10 observations each, 1995 yields 9, 1996 yields 8, 1997 yields 7, 1998 yields 6, and 1999 yields 5.
14. This frequency calculation is made by dividing the number of debt-coverage ratio (DCR) observations below the threshold by the total of 65 DCR observations.
15. See Hospitality Research Group of PKF Consulting, *Hospitality Investment Survey* 15, no. 1 (May 2004), for historical data from surveys of hotel lenders indicating a range of 1.38 to 1.53. See also American Council of Life Insurance, *Investment Bulletin* (2003).
16. A related question involves the distress costs associated with a particular financial package observed in the market.
17. Another way to think about the issue is from a creditor's viewpoint. Forward-looking creditors will not lend long term at a fixed rate that is lower than what they can expect to receive in numerous future short-term loans.
18. Alex Butler, Gustavo Grullon, and James Weston, "Can Managers Forecast Aggregate Market Returns?" *Journal of Finance* (forthcoming).

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