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Relative Risk Premium: A New “Canary” for Hotel Mortgage-Market Distress

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Abstract

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Keywords

hotels, relative risk premium, REIT, hotel loans, commercial mortgages

Disciplines

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Relative Risk Premium:

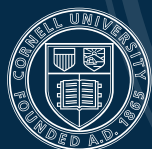
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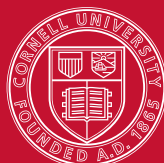
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EXECUTIVE SUMMARY

Lenders' evaluation of the hotel industry's prospects can be assessed using a metric called the relative risk premium, which we introduce in this report. Similar to the canary in a coal mine, changes in the relative rates that lenders charge for hotel loans, as compared to those for office buildings, give an early warning of relative hotel loan delinquencies. This metric is based on the practice of lenders charging higher interest rates for hotel loans than on office buildings. The relative risk premium measure is defined as the interest rate on hotels minus interest rate on office buildings. Changes in this measure predict relative hotel loan delinquencies (delinquencies on hotel loans minus delinquencies on office building loans). Office loans are an appropriate benchmark to measure the relative health of hotel loans because office building occupancy has a relationship with the economy and with room-night demand. Spreads on hotel loans widen when lenders anticipate higher hotel delinquencies relative to offices and narrow during periods when relative delinquencies for hotels are expected to drop. We also find three other bellwethers for hotel delinquencies: an increase in the volatility of hotel REIT returns (risk), a negative shock to expected earnings forecasts (which signals lower expected future profitability), or an increase in unemployment. Interestingly, the converse situation doesn't hold, and an increase in relative delinquencies is not useful in predicting a rise in the relative risk premium.

Keywords: risk premium, pricing of risk, delinquencies forecasting.

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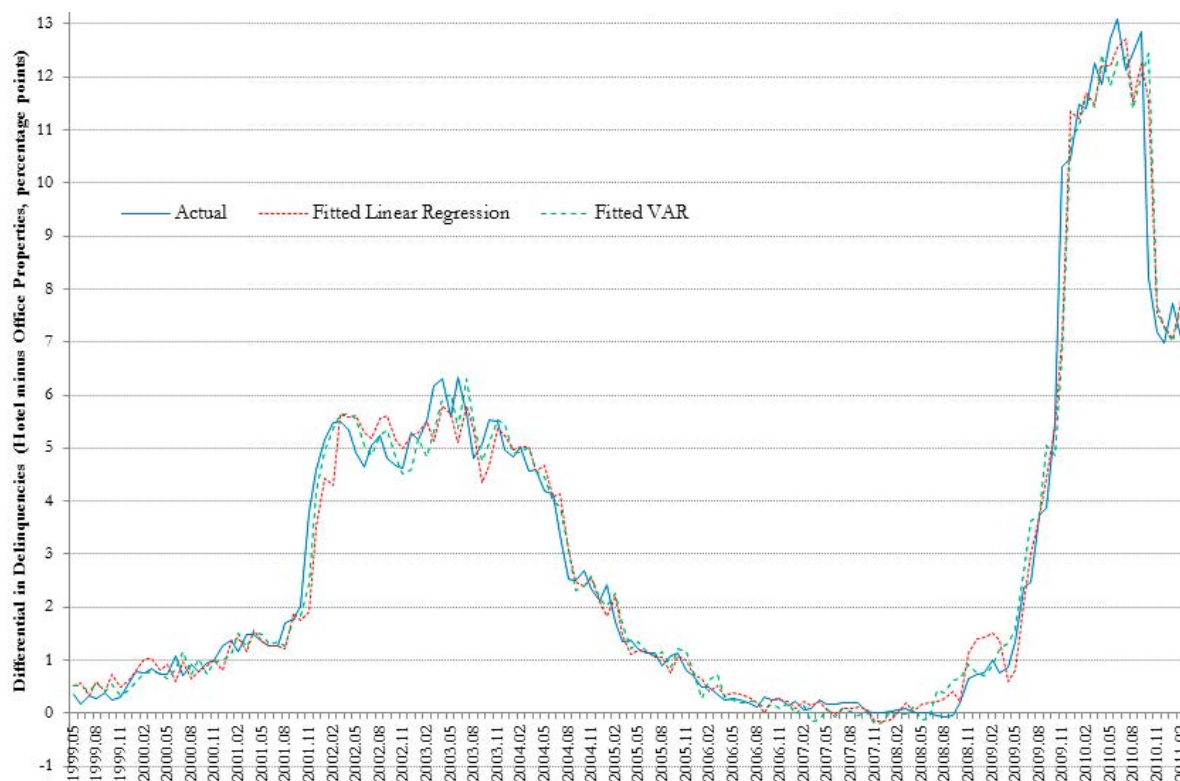
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This report introduces a new metric for hotel distress, the relative risk premium. Defined as the interest rate on hotels minus the interest rate on office buildings, the risk premium predicts relative hotel loan delinquencies (that is, delinquencies on hotel loans minus delinquencies on office building loans). The level of relative risk premium accounts for general variation in interest rate levels and focuses on the relative cost of funds for hotels. Similarly, working with relative delinquencies accounts for the variation in the degree of general distress in commercial real estate loans.

Relative delinquency rates: actual and model



As we explain in this report, the widening or tightening of the incremental hotel risk premium contains valuable information for forecasting hotel loan delinquencies. Spreads on hotel loans widen when lenders anticipate higher hotel delinquencies relative to offices and narrow during periods when relative delinquencies are expected to drop. We also find that the following act as bellwethers for hotel delinquencies: an increase in the volatility of hotel REIT returns (risk), a negative shock to expected earnings forecasts (signaling lower expected future profitability), or an increase in unemployment. Exhibit 1 shows how effective our “canary metric” is in forecasting hotel delinquencies. We must note, however, that the converse situation doesn’t hold, so that an increase in relative delinquencies is not useful in predicting a rise in the relative risk premium.

The Relationship of Hotels and Office Buildings

The reason we selected office properties as a comparison for hotels is that office space has an economic link with hotel demand. One might expect that retail (rather than office buildings) would seem to be a logical comparison to hotels, since retail uses percentage leases that give landlords a call option on the economy in good times and a base rent in bad

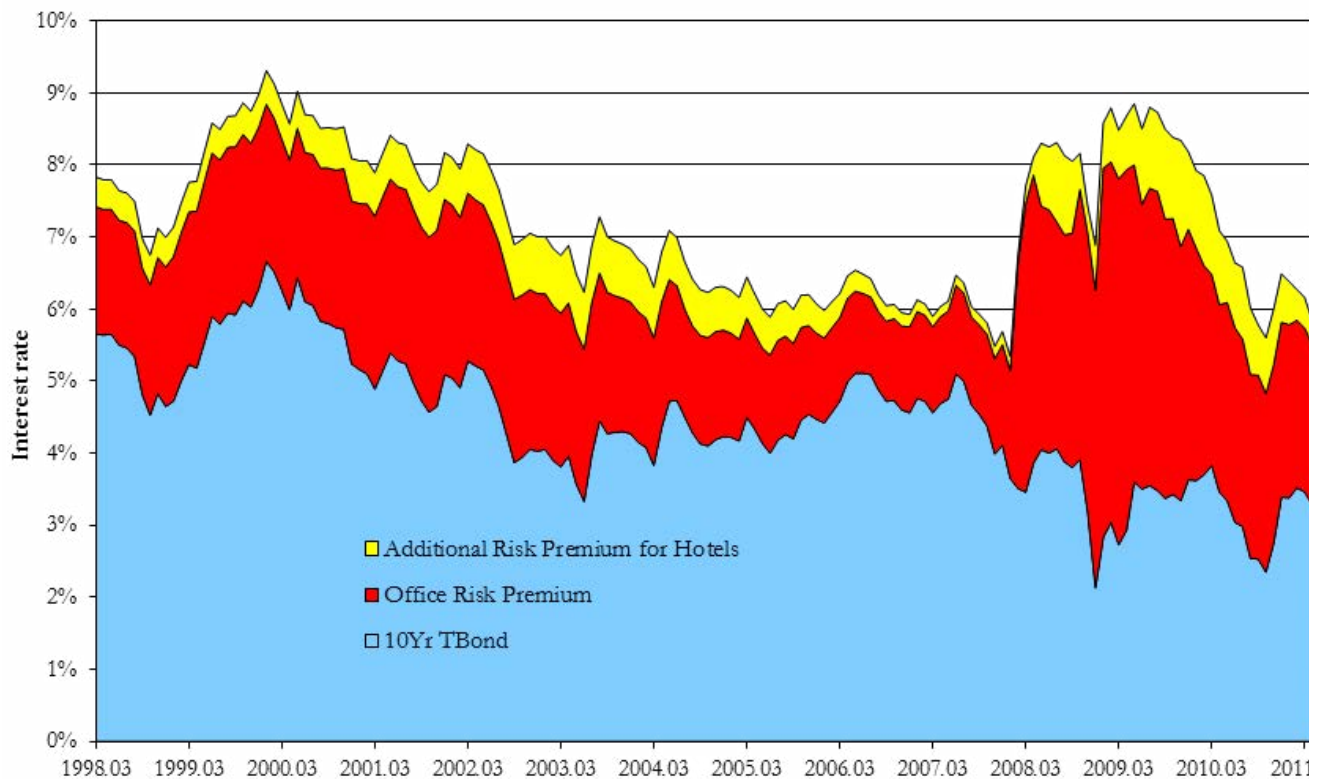
times.¹ Instead, several professional hotel advisory services, such as Cushman & Wakefield and HVS, have found that a historical relationship exists between occupied office space and room-night demand.² This relationship exists in part because corporate travelers are one of the three major sources of hotel demand.³ Another reason for choosing office property as a benchmark for comparison to hotels is the difference in lease characteristics. Office properties have lengthy, multi-year leases, in contrast to the 24-hour lease typical

¹ A percentage lease is a lease whose rental is based on a percentage of the monthly or annual gross sales made on the premises. Common types of percentage leases include a fixed minimum rent plus a percentage of the gross, a fixed minimum rent against a percentage of the gross, whichever is greater; and a fixed minimum rent plus a percentage of the gross, with a ceiling to the percentage rental among others.

² For example, Cushman and Wakefield found that for Washington, D.C. approximately 263 room nights are generated per year on average for every 1,000 square feet of occupied office space per year (Cushman and Wakefield, “More Than a Guessing Game: Number Crunching and Market Comparisons Shed Light on Hotel Demand,” http://valuation.cushwake.com/Valuation/documents/publications/BB_Hotel_Demand_CM_V_Aug08EN.pdf).

³ David Fuller and Caitlin McKenna, “The HVS Employment-Hotel Growth Index: A new tool for projecting hotel room night demand,” HVS Consulting and Valuation Services (March 2009).

Incremental interest-rate components for hotels



for hotels. Needless to say, the future cash flows from hotels' short-term "leases" entail greater uncertainty than long-term office leases. This is the reason that lenders generally require a greater risk premium for hotels. The short-term lease contract makes hotels more prone to shocks arising from capital market changes, the general economy, and event risk. Unlike office buildings, which are insulated from some of the risk of economic events by their five- to ten-year leases, hotels have a greater sensitivity to changes in the economy, which increases the loan pricing of risk in the form of higher interest rates than office buildings.

Analyzing the Relative (Differential) Risk Premium

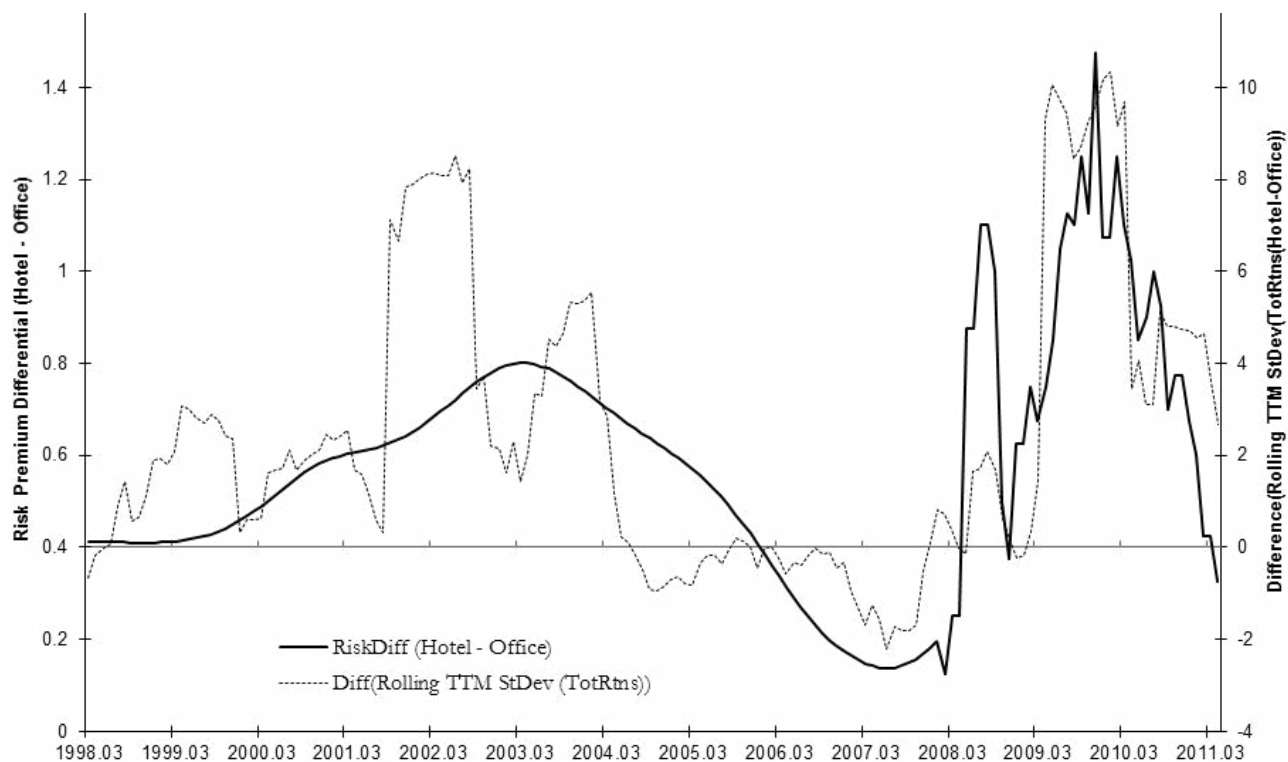
The nature of the hotel industry is an underlying factor in lenders' practice of charging a higher interest rate for hotel loans. They suggest that underwriting hotel property is riskier relative to loans on other property types because hotel loans represent both a business loan and a real estate loan. Lenders find it difficult to disentangle the hotel business from the underlying real estate. Loans on all other property types, in contrast, are mortgages on the real estate but not also a loan on the business that occupies the property. The fact that hotel rooms are essentially marked to market on a daily basis

increases their risk profile as compared to all other major property types that have longer term leases.

For these reasons, it makes sense to use a relative risk premium that compares hotels to other real estate, rather than an absolute risk premium, which would involve a comparison to U.S. Treasuries (viewed as having zero risk). The difference between the mortgage interest rate on a given property type and the risk-free rate is called the risk premium. The risk premium represents the return over and above the risk-free rate that the lender (or investor) requires as compensation for bearing the risk represented by the loan. We use a relative risk premium, which is the difference between the interest rate on hotels and the interest rate on office buildings. This is equivalent to the difference in the risk premiums on hotels and office buildings. As is the case with the risk premium over Treasuries, the relative risk premium is the lender's or investor's compensation for bearing added risk for lending on a riskier asset, relative to a less risky asset. We offer a detailed explanation and an example of the relative risk premium in Appendix A.

Exhibit 2 provides an illustration of the relative risk premium, by depicting the incremental interest rate components for hotels relative to offices and to the yield on a 10-year constant maturity Treasury bond. The area in blue

Difference in standard deviations of hotel and office returns



represents the nominal interest rate on 10-year constant maturity Treasury bond, which includes the real rate of interest and the inflation premium.⁴ The area in red denotes the risk premium for office properties, which is driven by implicit default risk and the systematic factors that drive all real estate property types, including the general real estate market risk premium, compensation for the general illiquidity of the commercial real estate market, transaction costs, tax treatment, and other imperfections in the commercial real estate market. In sum, the area in red can be thought of as the risk adjustment that is systematic in nature and is shared by all property types, plus the idiosyncratic risk associated with offices. The yellow section represents the difference between hotel and office interest rates. This is the risk premium differential, which captures the risk of hotels relative to office properties. Exhibit 3 displays a plot of the risk premium differential plotted with the difference in standard deviations of hotel and office returns. The positive standard deviation

⁴ Longer-maturity credit instruments such as 10-year treasuries are probably better at reflecting anticipated future economic conditions one to two years ahead. See: Simon Gilchrist, Vladimir Yankov, and Egon Zakrajšek, "Credit Market Shocks and Economic Fluctuations: Evidence from Corporate bond and Stock Markets," *Journal of Monetary Economics*, Vol. 56, No. 4 (May 2009), pp. 471–493.

difference is another indication that hotels have higher risk than office properties.

In summary, by looking at the interest rate differential between hotel and office property types, we already control for factors that systematically affect all property types, including the capital market and general economic conditions, regardless of whether they are observable.⁵ Consequently, we are better able to study traits that elicit a differential risk premium between property types.

The primary objective of this report is to determine whether the relative risk premium contains useful informa-

⁵ We also estimate a VAR model (not reported for brevity), which focuses on the relationship between financial variables in the office and hotel loan markets. The results support using office building loan market as a benchmark. The main findings are: (1) Rising interest rates (rates on a 10-year Treasury) result in rising loan rates for offices and hotels; (2) By itself, the risk-free rate (the rate on a 10-year Treasury) does not forecast delinquency rates for either offices or hotels. This result is as expected, when the information on loan performance is contained in the risk-adjusted rates, such as the spread; (3) Changes in interest rates on office loans have a strong and persistent effect on hotel loan rates, but the effect of shocks in hotel loan rates on office loan rates is much weaker in magnitude and less persistent; and (4) An increase in the level of delinquencies in office loans forecasts an increase in delinquencies in hotel loans. These results taken together point to the leading nature of office loan market, providing another justification for using office building loans as a benchmark.

tion to predict future hotel loan performance.⁶ Research has emphasized the information content of corporate spreads as indicators of default risk and also future economic activity. It has been shown theoretically that as credit spreads rise, the supply of funds starts to contract. As a consequence, asset prices fall and the likelihood of default increases as firm equity narrows.⁷ Despite that analytical frame, the pricing of risk in real estate markets has received relatively little empirical attention. To fill that void, we study the pricing in a market with short-term leases relative to pricing in a market with long-term leases. To allow for the mutual impact of inter-dependent economic time series, we use a vector autoregression (VAR) framework. We also examine whether lenders set hotel interest rates based on expected credit risk.⁸ Our study spans a variety of economic conditions including expansions and contractions.⁹

Data and Methodology

Our variables are intended to capture the state of the economy and the capital markets. The variables include expected earnings per share and the unemployment rate or the growth rate in employment, which are all metrics that influence either discretionary income or people's percep-

⁶ Studies on credit spreads have focused on one of three issues: (1) the relation between the risk free rate or its term structure and the credit spread, (2) the credit spread puzzle arising from the fact that the default risk isn't as variable as the credit spread over time, and (3) whether asset prices correctly reflect and in turn are affected by fundamental economic factors. In this study we focus on issue 3. For a recent discussion of the importance of understanding real estate debt performance and delinquencies see: Deniz Igan and Marcelo Pinheiro, "Exposure to Real Estate in Bank Portfolios," *Journal of Real Estate Research*, Vol. 32, No. 1 (2010), pp. 47-74.

⁷ Thomas Philippon, "The Bond Market's Q," *Quarterly Journal of Economics*, Vol. 124, No. 3 (2009), pp. 1011-1056.

⁸ For example, Morgan and Ashcraft find that interest rate spreads on loans are good predictors of future loan performance and rating downgrades for banks. Thus, interest rate spreads are good forward-looking measures of risk. The authors propose that regulators should consider basing capital requirements on loan interest. See: Donald Morgan and Adam Ashcraft, "Using Loan Rates to Measure and Regulate Bank Risk: Findings and an Immodest Proposal," *Journal of Financial Services Research*, Vol. 24, No. 2/3 (2003), pp. 181-200.

⁹ This is important because the longer economic history adds statistical power to the analysis in lieu of a shorter time period and more frequent sampling. If two time series make relatively slow movements through time (a common feature for economic data) then a long time series (spanning many years) is needed before the true joint tendencies of the two variables can be measured reliably. Obtaining many observations by sampling frequently (say, through weekly or even daily observations) does not appreciably increase the power to measure the joint relationship between the two time series if the data span a total of only a few years. Robert J. Shiller and Pierre Perron, "Testing the Random Walk Hypothesis: Power vs. Frequency of Observation," *Economic Letters*, Vol. 18, (1985), pp. 381-386. Also, Robert J. Shiller, *Market Volatility* (Cambridge, MA: The MIT Press, 1989).

EXHIBIT 4

Descriptions and sources of variables

Variable	Description and Source of Data
Delinquency rate (DELINQ)	Percentage of loans 30+ days delinquent or in foreclosure for hotels minus the percentage of loans 30+ days delinquent or in foreclosure for offices. Source: Trepp
Difference in Standard Deviation (DIFFSTDEV)	The percentage difference in the standard deviation of total returns on hotel REITs (real estate investment trusts) and office REITs. To calculate the standard deviation for each property type a rolling twelve month window is used on the total return series for a given REIT property type using daily returns data. $DIFFSTDEV = \sigma_{Hotel} - \sigma_{Office}$. Source: National Association of Real Estate Investment Trusts
Risk Premium Differential (RISKDIFF)	The percentage difference in the spread at time of origination between hotel loans and office building loans; interpreted as the additional risk premium associated with hotel. Source: Lehman Brothers and Cushman & Wakefield (http://www2.cushwake.com/sonngold/)
Percent Change (Growth Rate) in Total Employment (EMPL)	The change in the number of employed persons from period to period expressed as a decimal. Source: U.S. Bureau of Labor Statistics (BLS) (via http://www.economy.com/freelunch)
Percent Change in Forward Earnings per Share (PCTEPS)	$PctEPS = \{(EPS_t / EPS_{t-1}) - 1\} * 100$. EEPS is Forward Earnings per Share, analysts estimates of earnings per share for the S&P500. This measure is the change in anticipated profits (expressed as a percent) in contrast to the change in actual corporate profits. Source: http://www.yardeni.com
Unemployment rate (UNEMPL)	Number of unemployed persons divided by the labor force, where the labor force is the number of unemployed persons plus the number of employed persons; expressed as a percent. Source: U.S. Bureau of Labor Statistics (BLS) (via http://www.economy.com/freelunch)

tion of financial security. Exhibit 4 gives a description and sources of all variables.

The risk premium differential variable is based on the average spread for a property type over Treasuries at the time of loan origination (SATO) for mortgage loans for hotels and office property types. Monthly SATO for hotels and office buildings is obtained from Lehman Brothers for the period of July 1998 through January 2008. We update

the SATO data using the Cushman Wakefield Sonnenblick-Goldman survey of indicated monthly spreads for conventional commercial mortgage loans over a 10-year Treasury bond, beginning in February 2008 and ending in March 2011.¹⁰ These data give us a relatively long time series that encompasses both times of economic growth and recessions, allowing us to study the informational content of the spread under a variety of economic conditions. The Lehman data are normalized for loan size and loan-to-value ratio (LTV) to capture the true difference in SATO by property type, while the Cushman data are normalized for loan size but not LTV.¹¹ We used the Cushman data because the Lehman data series ended with the firm's collapse in 2008.¹²

Results

We find that the relative risk premium reflects information on expected relative delinquencies between hotels and office buildings. The interest rate spread in Exhibit 2 (the shaded yellow band) and Exhibit 3 (the heavy solid line) provide evidence of the substantial time series variation in the incremental risk premium for hotels over and above office properties. There is only a brief period in 2008 when lenders did not require additional compensation for originating hotel loans compared to office properties. In all other periods, lenders required a higher return on the money that they lent on hotels relative to office buildings. This was especially the case during the financial crisis. Thus, borrowing cost is linked to future loan performance for the two property types.

¹⁰ According to Christopher T. Moyer at Cushman & Wakefield, the rate ranges are based on general rate indications from lenders for those asset classes, recent quotes, and closed transactions.

¹¹ Studies have also used SATO data that hasn't been normalized. For example, the ACLI data on loan commitments made by life insurers that Nothaft and Freund use in their study are also not standardized for changes in terms and maturities (Frank Nothaft and James Freund, "The Evolution of Securitization in Multifamily Mortgage Markets and Its Effect on Lending Rates," *Journal of Real Estate Research*, Vol. 25, No. 2 (2003), pp. 91-112.). We do not use the ACLI data in the current study since it is quarterly while the Cushman and Wakefield data are monthly. In addition to this, hotel loans are not necessarily made in each quarter by insurance companies. However, we do use the ACLI data to assess our combined data series (which we first convert to a quarterly series). Our overall data series for both office buildings and hotels is highly correlated with the data series from one source (ACLI). To account for possible LTV differences for the Cushman and Wakefield data we also estimate all VARs and all regressions with a control for LTV differences added to the models. The results (not reported for brevity) remain the same.

¹² To account for the fact that our data use series from both Lehman and Cushman Wakefield Sonnenblick-Goldman, in addition to the results reported in the paper, we also estimate all VARs and all regressions in models that include a shift variable to account for change in the data. The results (not reported for brevity) remain the same.

Informational Content of the Risk Premium and Delinquency Data

To examine the information contained in the pricing spread we first start by separately examining the relative risk premium and relative delinquency data in univariate regressions. Efficient capital markets anticipate future developments and adjust prices for risky assets when expected conditions change. In this environment, the risk premium differential may contain useful information for forecasting relative delinquencies.

We test this hypothesis using regression analysis. We first use delinquency as our dependent variable, and then we use relative risk premium as the dependent variable. The regression of the relative risk premium (RISKDIFF) on the past level of relative delinquencies (DELINQ) is estimated as follows:¹³

$$RISKDIFF_t = 0.042 + 0.930 \cdot RISKDIFF_{t-1} + 0.018 \cdot DELINQ_t - 0.019 \cdot DELINQ_{t-1}$$

(2.05)** (22.70)*** (1.52) (-1.63)

The numbers in parentheses below coefficients are the *t*-statistic, with statistical significance marked by asterisks, as follows: *** = 1-percent level, ** = 5-percent level, and * = 10-percent level. The regression coefficient for $DELINQ_t$, our variable of interest, is not significant, indicating that changes in delinquency do not seem to have explanatory power over changes in the risk premium. As a robustness check, we also estimate this regression with the lagged delinquency variable (that is, regressions with $DELINQ_{t-1}$ or $DELINQ_{t-2}$ as the independent variable). The results are similar, and so we do not report them for the sake of brevity.¹⁴

To test whether differential risk premium contains information on future relative delinquencies, we estimate the following regression, with the lagged relative risk premium ($RISKDIFF_{t-2}$) as our variable of interest.¹⁵

¹³ Lagged values of the dependent and independent variables are included to control for serial correlation in the data. We find that including the lagged dependent and independent variables in the regression results in residuals without autocorrelation (the Durbin-Watson statistic is 2.05). The Durbin-Watson (DW) statistic is used to evaluate whether residuals in the regression have auto-correlation (that is, whether the residuals are correlated with their own past values). The values of DW statistic sufficiently close to 2.0 indicate that the residuals do not have auto-correlation.

¹⁴ In addition, to account for the fact that our data uses series from both Lehman and Cushman Wakefield Sonnenblick-Goldman we also estimate the regressions reported in this section and all regressions reported in Exhibit 6 in a model that includes a shift variable. The results (not reported for brevity) remain the same.

¹⁵ As with the prior regression, the other variables are included in the regression to control for serial correlation (the Durbin-Watson statistic is 1.7). The Durbin-Watson (DW) statistic is used to evaluate whether residuals in the regression have auto-correlation. The value of DW statistic of 1.7 is sufficiently close to 2.0 and indicates that the residuals do not have auto-correlation.

$$DELINQ_t = -0.404 + 1.67 \cdot RISKDIFF_{t-2} - 0.52 \cdot RISKDIFF_{t-3} + 0.92 \cdot DELINQ_{t-1}$$

(2.75)**
(2.97)***
(-0.87)
(37.96)***

As above the numbers in parentheses below the coefficients are the *t*-statistic, including indication of statistical significance. This result suggests that the relative risk premium is a predictor of the relative level of delinquencies, and we can conclude that the risk premium differential contains information for predicting relative delinquencies.

We perform one more robustness check including more lags, and estimate the following regression:

$$DELINQ_t = -0.454 + 1.54 \cdot RISKDIFF_{t-2} - 1.67 \cdot RISKDIFF_{t-3} + 1.43 \cdot RISKDIFF_{t-4} + 1.08 \cdot DELINQ_{t-1} - 0.17 \cdot DELINQ_{t-2}$$

(-3.02)**
(2.79)***
(-2.23)**
(2.43)**
(12.98)**
(-2.18)**

The Durbin-Watson statistic here is 1.99. The variable of interest is the lagged measure of the risk premium differential ($RISKDIFF_{t-2}$). The coefficient for this variable is positive (1.54) and significant (*t*-statistic of 2.79), confirming our results.

The results of the regressions are consistent with the presumption of efficient markets. Again, market prices anticipate future deterioration in cash flows. In summary, the relative risk premium contains information on the future relative levels in delinquencies with respect to univariate tests.

Multivariate Analysis

Having established that the risk premium is a predictor of relative delinquencies in a univariate analysis, we now use multivariate analysis to explore the link between loan delinquencies, economic and financial conditions, and the risk premium differential. Here again we seek to determine whether the relative risk premium might contain useful information for forecasting delinquencies and foreclosures or whether, conversely, the delinquency rate might be useful in forecasting the risk premium. Since the variables we study are interrelated, we use the vector auto-regression approach (explained in Appendix B) to simultaneously examine our variables of interest as a system of equations. The main advantage of a VAR over ordinary regression is that a VAR

takes into account mutual relationships in the inter-dependent economic time series. The VAR system includes the following: the risk premium differential ($RISKDIFF$); a risk differential measured as the difference in standard deviations between office REITs and Hotel REITs ($DIFFSTDEV$); the percentage change in the forward earnings per share, a measure of corporate profitability ($PCTEPS$); the unemployment rate ($UNEMPL$); and relative delinquencies ($DELINQ$). We include two time lags of each variable in this system, the previous month and the month before that.¹⁶ The growth rate in the expected earnings per share is included since it represents Wall Street's consensus on the expected health of the economy and also reflects corporate management's expectations. The unemployment variable is included since it captures the state of macroeconomy. Unemployment is also a demand indicator because it captures the level of economic activity as well as disposable income. The purpose of including $DIFFSTDEV$ as a capital markets variable is that this measure of the difference in the standard deviations is our proxy for the additional riskiness arising from hotel performance over and above office properties. Appendix A provides further elaboration on the rationale for these variables.

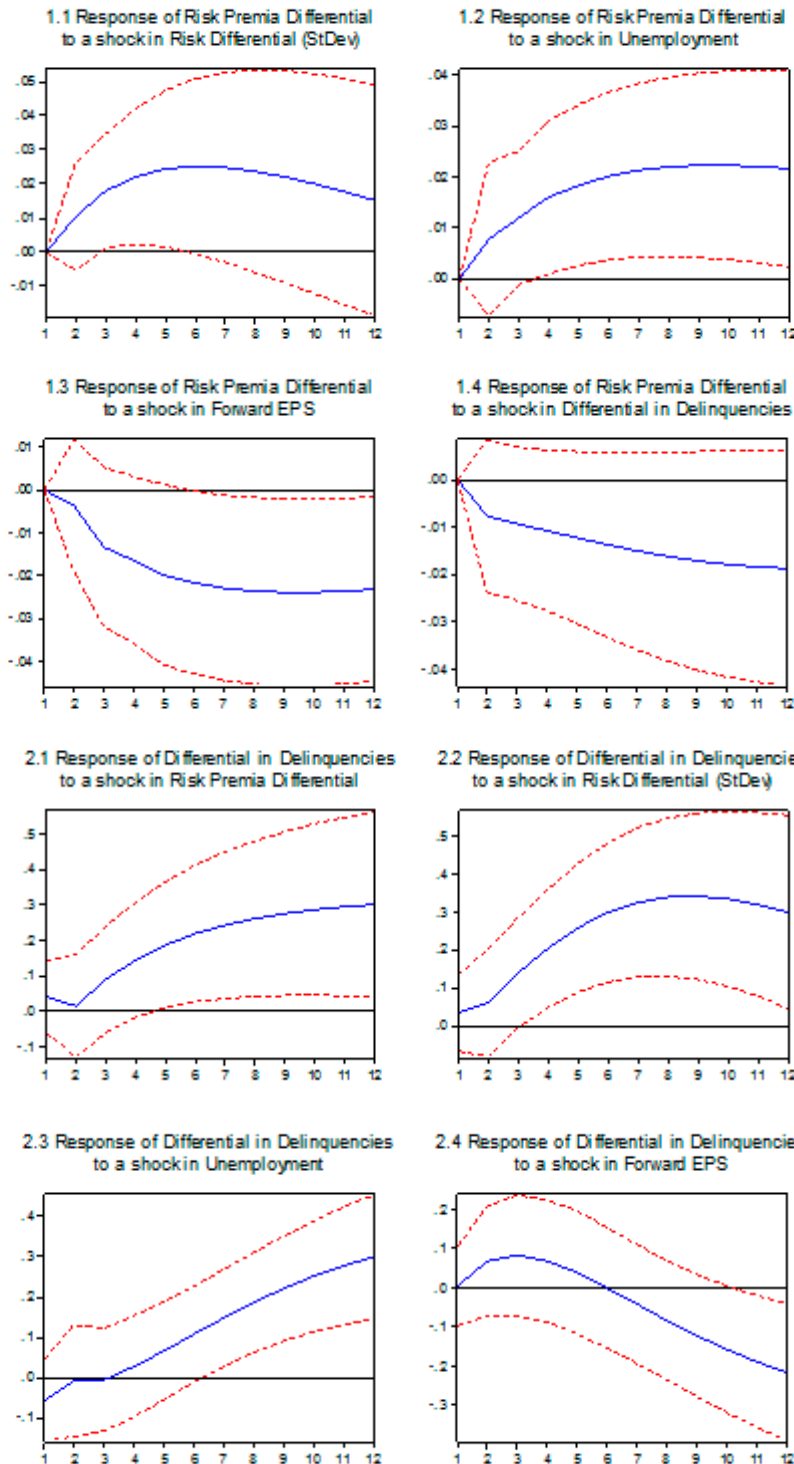
We use impulse response functions to analyze the results of our VAR analysis, as shown in Exhibit 5. The top four graphs in Exhibit 5 show the response of the relative risk premium (as shown on the y-axis) to changes in the other variables in the system. In each case the response is traced forward for 12 months (x-axis). Each graph in the top row contains: (1) the zero effect level (horizontal black line); (2) the change in the risk premium differential to a unit change in the corresponding independent variable (shown as blue curve on the y-axis); and (3) the 95-percent confidence interval (red dashed lines). If a risk premium response is within the error band from the zero effect for any graph, then this means that the response is not statistically different from zero. If a response is separated from the zero effect level by a standard error band, this means that the response in the dependent variable to a shock in this independent variable is statistically different from zero. Starting with the

¹⁶ We use our full sample of monthly data from July 1998 through March 2011 to estimate the system. We also estimate the system with a term spread to account for the variation in the term structure of interest rates; the results (not reported for brevity) are unchanged from the results discussed in this section.

EXHIBIT 5

Impulse response functions for risk premium differential and relative delinquency rate

Response to Cholesky One S.D. Innovations ± 2 S.E.



graphs at the top, the following results obtain:

- The relative risk premium increases with the relative riskiness of hotels, as shown by DIFFSTDEV (Graph 1.1);
- The relative risk premium increases given an unemployment shock (Graph 1.2);
- An increase in the expected earnings per share (EPS) lowers the relative risk premium, as shown by the narrowed interest rate spread (Graph 1.3); and
- Past delinquencies have no influence on the relative risk premium (Graph 1.4).

The bottom four graphs of Exhibit 5 depict the response of delinquencies in hotels relative to office buildings to changes in the other variables in the system. Following are the key points, going from the graph 2.1 on the left to graph 2.4 on the right:

- Relative delinquencies increase given a shock in the relative risk premium. Thus, the risk premium differential remains an important predictor of the change in relative delinquencies when the effect of other financial and economic variables on delinquencies has already been taken into account in a system (Graph 2.1);
- An increase in the risk differential forecasts an increase in delinquencies. Thus, the riskiness of hotels relative to office buildings calculated using REIT returns (DIFFSTDEV) in the capital markets helps to predict future delinquencies (Graph 2.2);
- Relative delinquencies six months in the future will increase given a shock in the unemployment rate (Graph 2.3); and
- An increase in expected EPS of the S&P 500 by Wall Street analysts forecasts a decrease in delinquencies (Graph 2.4).

EXHIBIT 6

Time series regressions of relative delinquency rate (DELINQ)

	DELINQ(t)	DELINQ(t)
Intercept	-0.728 (-2.35)**	0.158 (0.92)
DELINQ(t-1)	0.899 (10.49)***	0.892 (9.98)***
DELINQ(t-2)	-0.084 (-0.99)	0.010 (0.12)
RISKDIFF(-6)	1.146 (2.01)**	0.966 (1.74)*
RISKDIFF(-7)	-0.481 (-0.65)	-0.301 (-0.41)
RISKDIFF(-8)	-0.707 (-1.22)	-0.476 (-0.82)
DIFFSTDEV(-4)	0.075 (1.68)*	
DIFFSTDEV(-5)	-0.088 (-1.48)	
DIFFSTDEV(-6)	0.127 (2.75)***	
DIFFSTDEV(-6)		0.138 (2.98)***
DIFFSTDEV(-7)		0.007 (0.11)
DIFFSTDEV(-8)		-0.106 (-2.28)**
UNEMPL(-8)	0.707 (1.94)**	
UNEMPL(-9)	-0.100 (-0.19)	
UNEMPL(-10)	-0.423 (-1.12)	
EMPL(-9)		-0.987 (-1.89)**
EMPL(-10)		-12.78 (-0.23)
EMPL(-11)		-0.275 (-0.44)
Durbin-Watson	1.89	1.89

The multivariate time series regressions confirm our earlier result that the relative risk premium forecasts delinquencies in hotel loans relative to office loans. Exhibit 6 reports the results of these multivariate regressions. Each column represents a different regression specification, as we discuss next. The dependent variable in all regressions is the level of delinquencies in hotels relative to office buildings, $DELINQ_t$. Lagged values of the dependent variable and of the independent variables are included in the regressions to control for serial correlation in the data.

The first column includes a specification comprising the following explanatory variables: the risk premium (lagged by four months), the difference in risk between hotel and office building REITs, and unemployment.¹⁷ Consistent with the VAR analysis, we find that the risk premium has a significantly positive coefficient,¹⁸ indicating that an increase in the relative risk premium forecasts an increase in relative delinquencies. We also find that delinquencies are predicted to rise with either an increase in risk, as captured by the difference in risk between hotel and office building REITs, or worsening economic conditions, as captured by the unemployment variable.¹⁹

The specification in the second column includes a longer lag of the risk premium (six months rather than four), and we use the percentage change in total employment instead of the static unemployment rate. The results of the second specification are consistent with the results from the first specification, and both are again consistent with the results from VAR analysis. In short, these analyses indicate that the differential risk premium for hotels is an important variable for forecasting delinquencies in hotel loans relative to office loans.²⁰

Applications for Practitioners

This analysis shows that hotel interest rates contain forward-looking information on loan performance when compared to office building interest rates. However, lenders don't

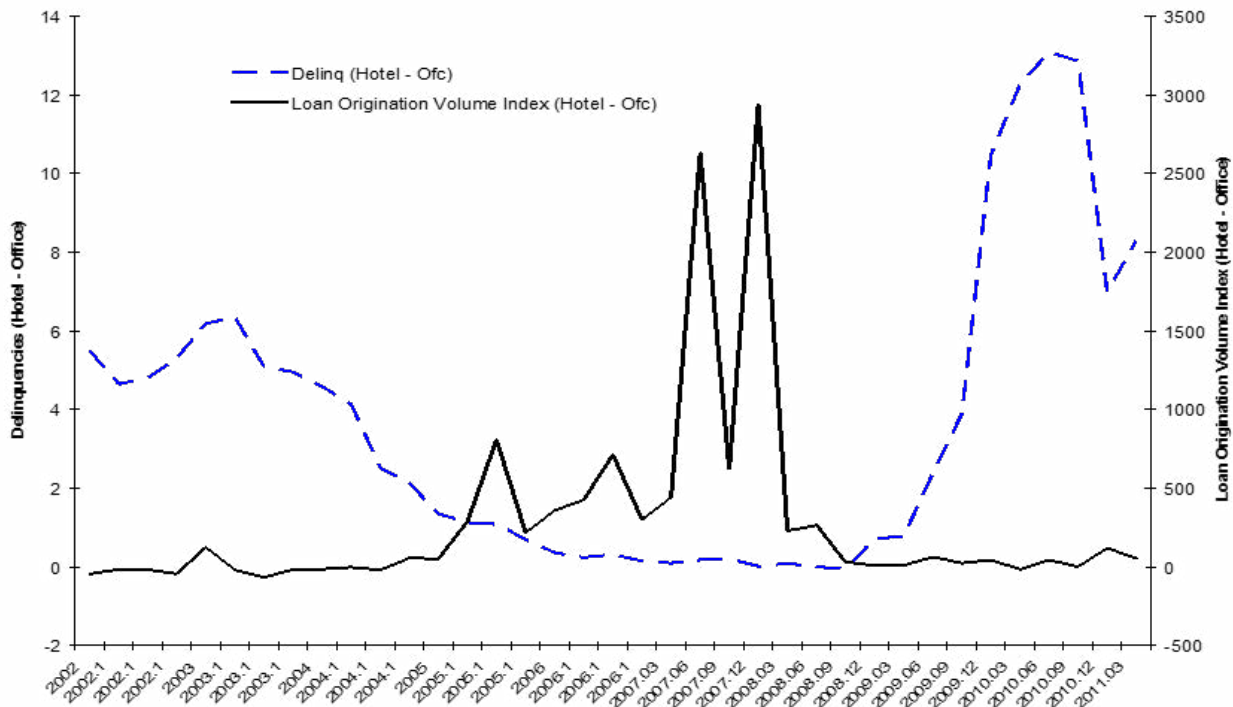
¹⁷ The lag structure for the explanatory variables is suggested by the results of the VAR analysis, after considering the significance levels in the impulse response functions.

¹⁸ The coefficient of 1.146, t-statistic of 2.01.

¹⁹ We also estimate the same models as in the table, but with the term spread variable added to account for variation in the term structure of interest rates, and a shift variable added to account for the shift in the data from Lehman to Cushman Wakefield Sonnenblick-Goldman. The results (unreported for brevity) are unchanged from those reported.

²⁰ To illustrate both the multivariate VAR model and the regression model, we plot model-implied delinquency rates and the actual (historical) rates in our data. The plot is presented in Exhibit 1. There are three curves on the plot. The first one (blue line) is the actual (historical) data. The second one (dashed red line) is the model-implied delinquency rate from the first regression model (the model in the first column of the table in Exhibit 6). The third curve (dashed green line) is the model-implied delinquency rate from the multivariate VAR model.

Relative delinquencies versus relative loan origination



Note: This graph depicts the co-movement of the level of delinquencies in hotels relative to office buildings (DELINQ) and the origination volume index for hotels relative to office buildings.

appear to take into account past relative loan delinquencies in setting the risk premium and hence the interest rate for hotel deals. Knowing the future trend in loan delinquencies is important, since loan origination volume moves inversely with delinquencies, a situation depicted in Exhibit 7. When hotel delinquencies increase relative to office delinquencies, lenders are more willing to lend on office buildings than on hotels.

In summary, based on our research, we can highlight several telltale signs that a rise in delinquencies is coming and thus a slowdown in mortgage originations on hotels will occur. Our “canary in a coal mine” factors, which can be found from the sources in the accompanying box, include:

- a widening of the interest rates on hotels relative to the interest rate on office buildings (a rise in the relative risk premium),
- a widening in the relative riskiness of hotels to office buildings calculated using REIT returns ($\sigma_{\text{Hotels}} - \sigma_{\text{Office}}$), and
- a decline in the expected earnings per share (EPS) for the S&P500, which is a proxy for an anticipated slowdown in the economy, and
- a rise in the unemployment rate. ■

“Canary” Factor Data Sources

Delinquencies by Property Type: <https://www.trepp.com/knowledge/research/>. Registration is required to see the free research portion of Trepp.

Interest Rates by Property Type: <http://www2.cushwake.com/songgold/>. (Cushman & Wakefield Sonnenblick Goldman Capital Markets Report)

REIT Returns by Property Type: <http://www.reit.com/DataAndResearch/IndexData/FNUS-Historical-Data/Monthly-Property-Index-Data.aspx>. To calculate the standard deviation, use the STDEV function in Excel for twelve months of returns.

Expected Earnings per Share: Expected EPS can be obtained either from Yardeni Research, Inc at <http://www.yardeni.com/premium/login2.aspx?ReturnUrl=%2fpremium%2fdefaultprem.aspx> (Look under Quant Center → Briefings → Valuation Database) or the Bloomberg machine, or FactSet.

Unemployment Rate: <http://www.economy.com/freelunch/default.asp>. The website is a part of Moody’s. Registration is free. Alternatively you can access the unemployment rate using <http://research.stlouisfed.org/fred2/>

Appendix A: Relative Risk Premium and Other Data Series

The interest rate on hotels minus the interest rate on office buildings is equal to the relative risk premium. As shown below, the nominal interest rate has two components—the nominal risk-free rate and the default premium, where the default premium is the extra interest required over and above the risk-free rate to compensate the lender for the probability of default:

$$\text{Interest rate}_{\text{Hotel}} = \text{Riskfree rate} + \text{Default premium}_{\text{Hotel}}$$

$$\text{Interest rate}_{\text{Office}} = \text{Riskfree rate} + \text{Default premium}_{\text{Office}}$$

$$\begin{aligned} \text{Relative Risk Premium} &= \text{Interest Rate}_{\text{Hotel}} - \text{Interest Rate}_{\text{Office}} \\ &= \text{Default Premium}_{\text{Hotel}} - \text{Default Premium}_{\text{Office}} \end{aligned}$$

We use the yield on the 10-year Treasury bond as the risk-free rate.

Example

According to the Cushman & Wakefield Sonnenblick Goldman Capital Markets Report dated July 15, 2013, the yield on the 10-year Treasury bond (T) is 2.68%, the default premium on Class A Office is 230 basis points (2.3%), and the default premium on a Full Service, Class A hotel is 295 basis points (2.95%).¹ Therefore

$$\text{Interest Rate}_{\text{Hotel}} = T + 295\text{bps} = 2.68\% + 2.95\%$$

$$\text{Interest Rate}_{\text{Office}} = T + 230\text{bps} = 2.68\% + 2.30\%$$

$$\begin{aligned} \text{Relative Risk Premium} &= \text{Interest Rate}_{\text{Hotel}} - \text{Interest Rate}_{\text{Office}} \\ &= 2.95\% - 2.3\% = .65\% \end{aligned}$$

In this example, then, the lender requires an additional .65% to make a hotel loan over a loan on an office property.

For the risk premium we use data from two sources, Lehman Brothers prior to January 2008 and Cushman Wakefield Sonnenblick Goldman thereafter. Wall Street analysts use spread at the time of loan origination (SATO) as a measure of default risk. The reason for using SATO as a default metric is that the yield spreads (interest rate – risk free rate) for various property types include two options, default risk (put option) and prepayment risk (call option). Prepayment risk for commercial mortgages is minimized through “lock out” provisions or “yield maintenance” requirements, which reduce the value of the call option while the value of the put option (default) remains unchanged.

We subtract the SATO corresponding to office loans from the SATO for hotels to obtain the risk premium differential at time t ($\text{SATO}_{\text{Hotel},t} - \text{SATO}_{\text{Office},t}$). Our variable of interest is the risk premium differential (incremental risk premium for hotels over and above office properties), as shown in the shaded yellow band in Exhibit 2 and solid line in Exhibit

¹ Cushman & Wakefield Sonnenblick Goldman, “Capital Markets Report,” <http://www2.cushwake.com/sonngold/> (as viewed on July 15, 2013).

3. A positive risk premium differential suggests higher risk including greater default (delinquency) risk since the hotel loan is made at a wider spread.

The real estate variable of interest is the incremental delinquency rate for hotels relative to office properties (DELINQ). The incremental delinquency rate is a useful indicator of the volume of distress that hotel loans are experiencing relative to office buildings. As we indicated in the source box, these data are published by TREPP, the commercial mortgage analytics firm, in their monthly “CMBS Delinquency Report.” The macroeconomic variables we examine include the percentage change or growth rate in expected corporate earnings per share on the S&P500 (PCTEPS), the growth rate in total employment (EMPL) expressed as a decimal, and the unemployment rate (UNEMPL).² The growth rate in the expected earnings per share is included since this represents Wall Street’s consensus on the expected health of the economy and also reflects corporate management’s short-term expectations.³ Since most overnight stays are business-related and corporations plan their travel in advance, expected earnings are used as an anticipated demand instrument.⁴ Expected earnings should also reflect future disposable income growth, because the leisure market segment depends heavily on disposable income. Finally, news about future corporate earnings could also reflect corporate borrowers’ shocks to their future ability to pay debt. Our rationale for including expectation variables is that if markets are efficient then credit spreads should reflect expectations in addition to realizations. As a capital market variable, we use the difference in the standard deviation of total returns on hotel REITs and office REITs (DIFFSTDEV). This is our proxy for the additional riskiness in performance of hotel REITs compared to office REITs as anticipated by stock market participants over a twelve-month period. We use volatility of REIT returns as a metric of the uncertainty about future returns on a property type. Other authors have used the implied volatilities of near-the-money options on the OEX(S&P100) index to proxy for changes in a firm’s future volatility in their study of credit spreads,⁵ and corporate bond studies

² Research indicates a connection between real estate returns and the macroeconomy. See: Nafeesa Yunus, “Modeling Relationships among Securitized Property Markets, Stock Markets, and Macroeconomic Variables,” *Journal of Real Estate Research*, Vol. 34, No. 2 (2012), pp. 127–156. We focus on the role of macroeconomic conditions in setting relative cost of capital. In equilibrium there is a direct link between cost of capital and returns.

³ Analysts typically form their expectations of earnings per share after conference calls with a firm’s management.

⁴ Wheaton and Rossoff use GDP as their primary demand instrument. See: William Wheaton and Lawrence Rossoff, “The Cyclic Behavior of the U.S. Lodging Industry,” *Real Estate Economics*, Vol. 26, No. 1 (1998), pp. 67–82. We do not use GDP our study since it is not forward looking. Besides this, GDP is published quarterly and revised monthly.

⁵ The other authors use noncallable, nonputtable debt of industrial firms in contrast to our study, where mortgages contain both a call and a put option. For example, see: Pierre Collin-Dufresne, Robert Goldstein, and Spencer Martin, “Determinants of Credit Spread Changes,” *Journal of Finance*, Vol. 56, No. 6 (2001), pp. 2177–2208. Further, studies have found that systematic volatility is not priced in the cross-section of equity REIT returns, but idiosyncratic volatility is priced, as discussed in: Jared DeLisle, McKay Price, and C.F. Sirmans, “Pricing of Volatility Risk in REITs,” *Journal of Real Estate Research*, Vol. 35, No. 2 (2013), pp. 223–248. This finding warrants our investigation of the role of standard deviation.

have often used stock returns to proxy for changes in a firm's health.. Titman and Torous indirectly show that greater variability of property values increases the likelihood of default in circumstances where the unpaid loan amount exceeds property value.⁶ REIT returns are used, given the greater frequency of monthly values relative to underlying property values, which are typically reported on a quarterly basis. In addition to this, REIT returns contain market expectations for a given property type in contrast to underlying property values. Other factors being equal, the volatility of hotel REITs should exceed office REIT volatility given the higher frequency of rent resetting for the hotel REITs due to their shorter lease term. Hotel property values should thus adjust more quickly relative to office values which are subject to existing contract rents on longer term leases.

⁶ Sheridan Titman and Walter Torous, "Valuing Commercial Mortgages: An Empirical Investigation of the Contingent- Claims Approach to Pricing Risky Debt," *Journal of Finance*, Vol. 44, No. 2 (1989), pp. 345–373.

Appendix B: Vector Autoregression (VAR)

A vector autoregressive system (VAR) is a system of simultaneous equations, similar to those found in algebra, when a set of equations has more than one unknown and the solution to finding the unknowns involves manipulating the entire system of equations. In the VAR system, all variables depend on all the other ones, are endogenous, and can have a relationship with all other variables in the system.

In a system with two equations, you might have the following:

$$6X + 4Y = 4$$

$$6X - 2Y = 16.$$

Our two unknown variables could be $X = \text{Occupancy}$ and $Y = \text{Average Daily Rate (ADR)}$. The product of these two variables, of course, is Revenue per Available Room (RevPAR), and all three of these variables are related. One can achieve identical RevPAR by having a high occupancy and a low ADR or a low occupancy and a high ADR. Occupancy depends on ADR and ADR depends on occupancy in much the same way that the interest rate and the loan amount are related. The interest rate charged depends on the loan amount borrowed and the loan amount borrowed depends on the interest rate. In this study we employ a vector autoregression (VAR) model to simultaneously analyze the information content of the risk premium differential for hotels and the information contained in our macroeconomic variables measuring activity in the economy as a whole, the capital markets, and the real estate markets. Using a VAR model is appropriate since our variables are interdependent with one another. PricewaterhouseCoopers (PwC) has used a VAR process to do hotel forecasts for various European cities. For example, PwC made the following comment:⁷

The econometric models used were similar to the PwC UK Hotels Forecasts models, based on a Vector Autoregression (VAR) framework. Each city has an independently-estimated VAR model. This type of model was chosen because it allows for interaction between occupancy and average room rates, as we observe in the market. Each VAR uses occupancy rate growth and real ADR growth as dependent variables, while the explanatory variables include lags of the dependent variables and a set of macroeconomic explanatory variables.

⁷ PwC, "Best placed to grow: European cities hotel forecast, 2011 & 2012," p. 44.

Occupancy and average daily rate for U.S. luxury chains

U.S. Luxury Chains			Let t = 2010.12			OCC(%)			ADR(\$)		
YMMM	OCC(%)	ADR(\$)		OCC(%)	ADR(\$)	t	t-1	t-2	t	t-1	t-2
2010.01	56.54	233.56	t	56.55	276.52	56.54			233.56		
2010.02	63.07	243.61	t-1	64.65	249.72	63.07	56.54		243.61	233.56	
2010.03	69.10	246.24	t-2	72.35	256.21	69.10	63.07	56.54	246.24	243.61	233.56
2010.04	69.79	244.73				69.79	69.10	63.07	244.73	246.24	243.61
2010.05	68.10	239.25				68.10	69.79	69.10	239.25	244.73	246.24
2010.06	70.28	233.19				70.28	68.10	69.79	233.19	239.25	244.73
2010.07	71.70	228.97				71.70	70.28	68.10	228.97	233.19	239.25
2010.08	68.52	227.93				68.52	71.70	70.28	227.93	228.97	233.19
2010.09	67.06	247.66				67.06	68.52	71.70	247.66	227.93	228.97
2010.10	72.35	256.21				72.35	67.06	68.52	256.21	247.66	227.93
2010.11	64.65	249.72				64.65	72.35	67.06	249.72	256.21	247.66
2010.12	56.55	276.52				56.55	64.65	72.35	276.52	249.72	256.21

The variables used in the PWC model are as follows:

Dependent Variables: Occupancy (%), Average Daily Rate (ADR)

Explanatory Variables: GDP, Exchange rates (X), Unemployment (U),
Investment (I), Consumer expenditure (C),
Domestic interest rate (R), and Hotel room supply (S)

To examine the joint evolution of the preceding two dependent variables—Occupancy and ADR—the following VAR system consisting of two regression equations, one for each variable is simultaneously estimated.

$$OCC_t = \alpha_1 + \beta_{1,1}OCC_{t-1} + \beta_{1,2}OCC_{t-2} + \beta_{1,3}ADR_{t-1} + \beta_{1,4}ADR_{t-2} + \beta_{1,5}GDP_t + \beta_{1,6}X_t + \beta_{1,7}U_t + \beta_{1,8}I_t + \beta_{1,9}C_t + \beta_{1,10}R_t + \beta_{1,11}S_t$$

$$ADR_t = \alpha_2 + \beta_{2,1}OCC_{t-1} + \beta_{2,2}OCC_{t-2} + \beta_{2,3}ADR_{t-1} + \beta_{2,4}ADR_{t-2} + \beta_{2,5}GDP_t + \beta_{2,6}X_t + \beta_{2,7}Y_t + \beta_{2,8}I_t + \beta_{2,9}C_t + \beta_{2,10}R_t + \beta_{2,11}S_t$$

In each regression equation, past (lagged) values of the dependent variable are included. For example, in the first equation above, the values of the past Occupancy (OCC) variable are included: with one lag, OCC_{t-1} and with two lags, OCC_{t-2} . Thus, the system is said to be estimated with two lags. Each regression equation also includes the past (lagged) values of the other two variables in the system. When the equations are estimated simultaneously, the estimates of the coefficients α_i and $\beta_{i,j}$ are obtained. To give the reader a better sense of the subscripts t, t-1, and

t-2 relative to occupancy and ADR, we provide the following example. The data for this example, shown above in Exhibit B1, come from STR for the U.S. luxury market.

If we let time (t) equal December 2010 (i.e., t = 2010.12), then the occupancy is 56.55 percent and ADR is \$276.52 at time t. In November (t-1) occupancy is 64.65 percent and ADR is \$249.72. In October (t-2) occupancy is 72.35 percent and ADR is \$256.21. Exhibit B1 shows this occupancy series (t) at one lag (t-1) and two lags (t-2). A similar situation holds for the ADR series lagged using one lag and two lags.

The VAR technique is useful in examining complex relationships among variables when the variables are serially correlated—that is, past values tend to persist (for example, if occupancy or ADR is high in the prior periods it is also high in the current period). Typically, VARs have little serial correlation in the residuals. This is helpful for separating out the effects of economically unrelated influences in the VAR. We use the VAR to reveal the evolution of the credit spread and the other economic variables as well as the dynamic interactions between the variables.

The VARs are analyzed by examining impulse response functions (IRFs), which graphs how a given variable in the VAR system responds over time to a change (a shock) in every other variable in the system. A VAR provides a way of letting the data determine the dynamic structure of a model. Thus, after estimating a VAR, an impulse response function characterizes its dynamic structure. The impulse responses do this by showing how shocks to any one variable filter through the model to affect every other variable, and eventually feed back to the original variable itself.

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2014 Reports

Vol. 14 No. 20 Cyborg Service: The Unexpected Effect of Technology in the Employee-Guest Exchange, by Michael Giebelhausen, Ph.D.

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Vol. 14 No. 17 Show Me What You See, Tell Me What You Think: Using Eye Tracking for Hospitality Research, by Stephani K. Robson, Ph.D., and Breffni A. Noone, Ph.D.

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Vol. 14 No. 3 Compendium 2014

Vol. 14 No. 2 Using Economic Value Added (EVA) as a Barometer of Hotel Investment Performance, by Matthew J. Clayton, Ph.D., and Crocker H. Liu, Ph.D.

Vol. 14 No. 1 Assessing the Benefits of Reward Programs: A Recommended Approach and Case Study from the Lodging Industry, by Clay M. Voorhees, Ph.D., Michael McCall, Ph.D., and Bill Carroll, Ph.D.

2013 Reports

Vol. 13 No. 11 Can You Hear Me Now?: Earnings Surprises and Investor Distraction in the Hospitality Industry, by Pamela C. Moulton, Ph.D.

Vol. 13 No. 10 Hotel Sustainability: Financial Analysis Shines a Cautious Green Light, by Howard G. Chong, Ph.D., and Rohit Verma, Ph.D.

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Vol. 13 No. 5 Network Exploitation Capability: Model Validation, by Gabriele Piccoli, Ph.D., William J. Carroll, Ph.D., and Paolo Torchio

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