9-25-2011

The Dynamics of Credit Spreads in Hotel Mortgages and Signaling Implications

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Keywords

Cornell, hotel mortgages, vector autoregression, relative loan price, hotel leases

Disciplines

Hospitality Administration and Management | Real Estate

Comments

Required Publisher Statement

The Center for Real Estate and Finance

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WORKING PAPER SERIES

WORKING PAPER 2011-0011

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Abstract

This paper investigates the loan pricing of risk in a market with short term leases (hotels) relative to longer term leases (office properties) with respect to how news on the economy, capital and real estate markets is incorporated in loan pricing using a vector autoregression (VAR) framework. The hotel loan pricing data provides a unique laboratory to study loan pricing adjustments given the short-term nature of the hotel leases. We examine the information content of hotel credit spreads in two stages. After establishing the impact of economic variables on loan pricing and the informational content of the incremental risk spread, we next examine how loan pricing adjusts in response to expected delinquencies. We find that improvement in general economic conditions, an increase in forward looking corporate profitability, an increase in capital availability and/or an increase in the demand for hotel services forecast a decline in the hotel risk premium differential. Thus, the relative loan prices—the spread—reflect systematic risk. We also find that hotel spreads themselves contain important economic information. Unexpected increases in hotel spreads predict hotel delinquencies. In other words, lenders appear to set interest rates on hotel mortgages in anticipation of hotel delinquencies and foreclosures in future periods. Lenders do not appear to consider past delinquencies in their setting their rate.

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Introduction

This paper takes advantage of a natural laboratory offered by hotel financing to study the loan pricing in a market with short term leases (hotels) relative to longer term leases (office properties) with respect to how news on the economy, capital and real estate markets is incorporated in loan pricing. In obtaining financing for hotels, the contract interest rates for hotel mortgages substantially exceeds those reported for other property types. We study whether the difference in loan pricing in the two markets is systematically priced by fundamental factors.

The argument that lenders advance is that underwriting hotel property is a cross between a business loan and a real estate loan because hotels constantly sell their rooms at the prevailing market rates e.g., rooms are essentially marked to market on a daily basis. A question which thus arises is whether this higher interest rate contains important information regarding the market conditions. In other words, is it justified and is it informative? Further, is it possible to find forward looking factors of the spread in hotel interest rates that will allow hotel investors and lenders to take appropriate action in advance of the rate shift? A related question involves whether real estate lenders set hotel interest rates based on expected credit risk.[1]

The objective of this paper is to address the informational content of the spread.[2] Using spreads at the time of loan origination (SATO) for mortgage loans by property type from Lehman Brothers (July 1998 – January 2008) and Cushman Wakefield Sonnenblick-Goldman (February 2008 – March 2011) we examine the time-series movements in the average spread. Our study spans a variety of economic conditions including expansions and contractions thus

[1]For example, Morgan and Ashcraft (2003) find that interest rate spreads on loans are very good predictors of future loan performance (loan default risk) and rating downgrades for banks. In other words, interest rate spreads as good forward-looking measures of risk. As a result of their findings, the authors propose that regulators should consider basing capital requirements on loan interest.

[2]Prior studies on credit spreads have focused on one of three issues. These issues are 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) do asset prices correctly reflect and in turn are impacted by fundamental economic factors. We focus on the latter issue in the current study.

making use of a long time-series of spreads. The time span of the analysis is important because it allows us to subsume a variety of economic events. As Shiller and Perron (1985) and Shiller (1989) show, increasing the number of observations by sampling more frequently while leaving the total time span of the data unchanged may not increase the power of tests very much[3].

Given the significant time variation in the credit spreads, we explore their informational content. Prior research on the role of asset prices in signaling future economic conditions and propagating economic fluctuations has emphasized the information content of corporate spreads as default risk indicators and indicators of future economic activity. For example, Philippon (2009) theoretically shows that as credit spreads rise, the supply of funds start to contract which results in falling asset prices and consequently an increase in the likelihood of default as the equity in deals narrows.

We explore the information content embedded in the hotel credit spread including whether this risk premium is systematically priced by fundamental factors and additionally if it possesses forecasting ability for future loan performance. Thus, we study the pricing in a market with short term leases relative to pricing in a market with longer term leases. A VAR framework is used which allows for the mutual impact of inter-dependent economic time series. The prior literature[4] indicate that higher credit spreads for commercial mortgages i.e., differences between mortgage rates and Treasury Bond rates with the same maturities should exist for more volatile property types and property types with more investment flexibility i.e., property that can be expanded or renovated. Similar results should also obtain if the differential risk premia i.e., difference in the

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[3]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. Shiller (1989) stresses the argument that 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.

[4]Titman, et al (2005) investigates what are the determinants of credit spreads for commercial mortgages. Credit spreads are defined as differences between mortgage rates and Treasury Bond rates with the same maturities.

interest rate on hotels and office property types is investigated in lieu of credit spreads using a transitive logic process.

Our empirical results are consistent with the prior literature. In particular, hotels have higher spreads relative to offices since they are not only riskier but also have greater adjustment costs (investment flexibility given higher and more frequent capital expenditures for hotels). The relatively short lease maturity associated with hotels should make hotels more sensitive to changes in fundamental factors which in turn should increase the loan pricing of risk of hotels relative to that of offices. Our study finds that this is the case with the differential risk premium systematically priced. In other words, loan pricing -- the spread -- reflects systematic risk and can be seen as a compensation for systematic risk factors. This is the first distinguishing feature of our study. Fundamental factors that account for this systematic pricing of the hotel risk premium differential include general economic conditions, expected corporate profitability, real estate capital availability and the demand for hotel services. An increase in these variables is a bellwether to a decline in the hotel risk premium differential. We also find that the interest rate spread has important economic information for forecasting loan delinquencies. An increase in the loan spread (risk premia differential) has forecasting power for predicting an increase in loan delinquencies. However, the converse situation doesn't hold e.g., the risk premium differential does not increase in response to a shock in delinquencies. In addition to our main finding that risk premia predicts loan delinquencies, we also find a parsimonious set of economic variables that has predictive power for delinquencies. We find that an increase in the risk differential (measured as the difference in standard deviation of returns on hotels and office properties) forecasts increase in delinquencies. A positive shock to expected earnings forecasts, indicating higher expected future predictability, forecasts a decrease in delinquencies, albeit after a longer lag. Finally, an increase in unemployment, a variable that captures economic conditions, forecasts an increase in delinquencies. However, even after we control for the effect of these financial and economic variables on delinquencies in our VAR process, the risk premium differential remains an important variable for forecasting a change in delinquency levels. This is the second distinguishing feature of our study.

Why Analyze Differential Risk Premia?

Components of Interest Rates

There are several underlying factors that influence the movement of interest rates[5]. The first component is the nominal risk-free interest rate which consists of the real rate of interest and the expected inflation premium. The second component is a market risk premium for risky assets that reflects uncertainty. Lenders require additional interest to compensate for increased risk. A third component is the term structure of interest rates. The longer the term of the loan, the higher the rate is in general. The final component is the idiosyncratic risk premium which is specific to a particular investment, in the current study, hotel properties. Figure 1 shows the incremental interest rate components for hotels. The area in blue represents the nominal interest rate on 10-year constant maturity Treasury bond which includes the real rate of interest and the inflation premium. Gilchrist et al (2009) argue that longer-maturity credit instruments such as 10-year treasuries are probably better at reflecting anticipated future economic conditions one to two years ahead. The area in red denotes the risk premium for office properties. The interest rate on office properties is higher than yields on Treasuries of comparable maturities because of implicit default risk among other factors. The spread over Treasuries also reflects the systematic factors

[5]See Liu and Quan (2010) for a general discussion of factors driving the hotel investment discount rate

that drive all real estate property types including the general real estate market factor (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 among others. In other words, the area in red can also be thought of the risk adjustment that is systematic in nature in addition to the idiosyncratic risk associated with offices. The final component in yellow represents the difference between hotel and office interest rates. We will hereafter refer to this idiosyncratic risk premium for hotels as the risk premia differential i.e., risk of hotels relative to office properties. This idiosyncratic risk premium varies by approximately 58 basis points (.584%) on average over the course of our study.

Symbiotic Relationship between Office and Hotel Property Types

A question which arises is why the focus on the idiosyncratic risk premium for hotels relative to office properties? What is so special about office properties? Why not use some other property type such as retail which uses percentage leases[6] which gives landlords a call option on the economy in good times and a base rent in bad times. For one, several professional hotel advisory services such as Cushman & Wakefield[7] as well as HVS[8] have found that a historical relationship exists between occupied office space and room night demand although this relationship tends to vary by city. Consequently, occupied office space is a useful indicator of anticipated room-night demand. Table 1 shows that approximately .42 room nights is generated per year for every 1,000 square feet of occupied office space per year on average while Figure 2 provides a graphical depiction of this relationship over time for the U.S. as a whole. According

[6]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.

[7]For example, Cushman and Wakefield (2008) 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.

[8]HVS finds that a strong correlation also exists between office supply and hotel supply.

to Fuller, et al (2008), this relationship exists since corporate travelers are one of the three major sources of hotel demand.

Another reason for choosing the office property type as a benchmark within which to compare hotels with respect to interest rate deals with lease characteristics, a source of fixed time-invariant differences in interest rates (fixed effect[9]). Longer leases characterize office properties while a short-term 24-hour lease is typical for hotels. Greater uncertainty of future cash flows is associated with short-term leases which in turn require a greater premium (higher borrowing cost) to compensate for this risk. Sivitanidou and Sivitanides (1997) argue that differences in lease length could also induce different income growth expectations. In particular, smaller rental changes tend to correspond to longer leases while shorter lease allow owners to take advantage of rent increases as the result of improving market conditions. The short term nature however also makes hotels more prone to shocks in the capital market factors (e.g., stock returns) and the general economy. Figure 3 displays risk premia differential plotted with the difference in standard deviations of hotel and office returns. The difference in standard deviations is positive, indicating that hotels have higher risk than office properties.

Another related fixed effect to consider is adjustment costs or investment flexibility i.e., property that can be expanded or renovated. Typically hotels require higher capital expenditures (also known as planned improvement programs or PIPs in hotel parlance) relative to offices given the higher tenant turnover which is a function of the length of the lease. Thus lenders may require a risk premium to compensate for greater adjustment costs. Intuitively, the interest rate on the office property type is analogous to a risky long term straight bond with the interest rate on hotels resembling a long term straight bond plus an option.

[9]Please see Sivitanidou and Sivitanides (1997) for a more complete discussion of some of the potential fixed effects or differentials.

Spreads relative to Treasury

A related question is why not focus on the differences between mortgage rates and Treasury bond rates as in the prior literature (see, for example, Nothaft and Freund (2003), Maris and Segal (2002), and especially Titman, et al (2005))? By looking at the differential in interest rates between hotel and office property types, we already control for factors that systematically impact all property types to a similar extent such as general real estate market (e.g., overall real estate risk premium), capital market (e.g., credit spread of corporate bonds), and general economic conditions regardless of whether they are observable or not. Consequently, we are better able to study idiosyncratic traits that elicit differential risk premia between property types. Working with measures in terms of differentials is an important feature of our study.

Data and Methodology

Data

The average spread for a property type over Treasury at the time of loan origination (SATO) for mortgage loans for hotels and office property types, is obtained from Lehman Brothers for the period starting July 1998 through January 2008. We update the SATO data using Cushman Wakefield Sonnenblick-Goldman survey of indicated spreads[10] for conventional commercial mortgage loans over a 10-year Treasury bond beginning in February 2008 and ending in March 2011. This gives us a relatively long time series that encompasses both the times of economic growth and the times of economic distress (recessions). We therefore are able to study the informational content of the spread in a variety of economic conditions. The Lehman data is normalized for loan size and loan to value to capture the true difference in SATO by

[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.

property type while the Cushman data is not.[11] The Cushman data is used since the Lehman data was discontinued with the collapse of Lehman Brothers. Wall Street analysts use SATO as a measure of default risk e.g., default models use loan specific SATO as one of the key performance drivers. The intuition 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 often 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 from the SATO for hotels to obtain the differential risk premia at time t ($SATO_{Hotel,t} - SATO_{Office,t}$). The differential risk premia (incremental risk premium for hotels over and above office properties, see the shaded yellow band in Figure 1) is our variable of interest. A positive risk premia differential suggests higher risk including greater default (delinquency) risk since the hotel loan is made at a wider spread relative to an office loan.

The macro-economic variables we examine include percent change or growth rate in expected corporate earnings per share on the S&P500 (PCTEPS), growth rate in total employment (EMPL), and the rate of unemployment (UNEMPL). The addition of the growth rate in expected earnings per share are included since they do not only represent Wall Street's consensus on the expected movements in the economy but also partly reflect corporate management's short term expectations[12]. Since most overnight stays are business related and corporations plan their travel in advance, expected earnings are used as anticipated demand

[11]Prior 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 (2003) use in their study are also not standardized for changes in terms and maturities. 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.

[12]Analysts typically form their expectations of earnings per share after conference calls with a firm's management and the announcement by management of forward looking earnings.

instrument.[13] Expected earnings should also reflect future disposable income growth; the leisure demand market segment depends heavily on disposable income. Finally, news about future corporate earnings could also reflect corporate borrowers' shocks to their ability to pay debt in the future. Our rationale for including expectation variables is that if markets are efficient then credit spreads should reflect expectations in addition to realizations. A capital market variable used is the difference in the standard deviation of total returns on Hotel REITs (real estate investment trusts) and Office REITs (DIFFSTDEV). The difference in the standard deviations is our proxy of the additional riskiness in performance of hotel REITs over and above office REITs that the stock market participants anticipate over a twelve month period. Collin-Dufresne et al (2001) use 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.[14] Previous corporate bond studies have often used stock returns to proxy for changes in a firm's health. In an analogous manner, we use volatility of REIT returns as a metric of the uncertainty about future returns on a property type. Titman and Torous (1989) indirectly show that greater variability of property values increases the likelihood of default in circumstances where the unpaid loan amount exceeds property value. REIT returns are used given the greater frequency (monthly) of values relative to underlying property values which are typically reported on a quarterly basis. In addition to this, REIT returns contain market expectations (are forward looking) for a given property type in contrast to underlying property values. The volatility of hotel REITs should exceed office REIT volatility given the higher frequency of rent resetting of the former due to shorter lease term, ceteris paribus. Hotel property values should thus adjust

[13]Wheaton and Rossoff (1998) use GDP as their primary demand instrument. We do not use GDP our study since it is not forward looking. Besides this, GDP is published quarterly and revised monthly.
[14]The authors use noncallable, nonputtble debt of industrial firms in contrast to our study wherein mortgages contain both a call and a put option.

more quickly relative to office values which are subject to existing contract rents on longer term leases. 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 hotel loans percolating. In sum, we study a system with several variables capturing the state of the economy and the demand for hotel services. The variables include expected earnings per share, the unemployment rate and/or the growth rate in employment, which are all metrics that influence either discretionary income or the perception of financial security. Appendix A gives a description and source(s) of each of these variables.

Vector Autoregression Model (VAR)

To analyze the information content of the incremental credit spread for hotels as well as the information contained in our macroeconomic variables measuring activity in the economy as a whole, the capital markets and the real estate markets, we employ a vector autoregression (VAR) model. Vector autoregressions are a useful and flexible way of analyzing economic relations in a time series data. More specifically, the VAR allows for the mutual impact of the variables; it is thus well suited for inter-dependent economic time series. In other words, the technique is useful in examining complex relationships among variables when the variables are serially correlated. Typically, VARs have little serial correlation in the residuals. This is helpful for separating out the effects of economically unrelated influences in the VAR. All variables in a VAR are treated equally by including for each variable, an equation explaining its evolution based on its own lags and the lags of all other variables in the model. An example of a simple vector autoregression for two variables y_t and z_t follows:

$$y_t = \alpha_y + \beta_y y_{t-1} + \delta_y z_{t-1} + \varepsilon_t^y$$
$$z_t = \alpha_z + \beta_z y_{t-1} + \delta_z z_{t-1} + \varepsilon_t^z$$

where α_y, α_z, β_y, β_z, δ_y and δ_z are parameters and the epsilons (ε_t^y, ε_t^z) are white noise. Thus, the VAR recognizes that variables can have an impact on other variables. VAR generalizes easily to more variables and more lags of variables. In the current setting, we use the VAR model to reveal the evolution of the credit spread and the macroeconomic variables as well as the dynamic interactions between these variables.

Results

Stage 1: Economic Dynamics of the Spread

Our initial point of departure is an analysis of the variation in the relative spread. There is a substantial time series variation in the differential risk premia (incremental risk premium for hotels over and above office properties) as seen in the shaded yellow band in Figure 1. What economic, market, and industry variables account for time series variation in the spread in a parsimonious model? This is an important question for understanding loan pricing in the real estate market. Our variable of interest is the relative cost of capital (spread) between the market with relatively short leases and the market with longer leases. Understanding the behavior of the spread will result in better understanding of the connection between economic and market conditions and relative pricing in real estate markets with different effective lease durations. Our investigation proceeds in several steps, as we relate the risk premia differential to factors that can account for the sources of variation in the higher risk premia. We employ a sequential process to determine whether the existing variables in our VAR system remain relatively stationary and continue to forecast the spread as well as to ascertain if our newly introduced factors.

We start by estimating a simple VAR system that includes two variables, risk premia differential and risk differential,

$$RISKDIFF_t = \sum_{i=1}^{L} \alpha_i \cdot RISKDIFF_{t-i} + \sum_{i=1}^{L} \beta_i \cdot DIFFSTDEV_{t-i} + u_t$$

$$DIFFSTDEV_t = \sum_{i=1}^{L} \delta_i \cdot RISKDIFF_{t-i} + \sum_{i=1}^{L} \gamma_i \cdot DIFFSTDEV_{t-i} + v_t$$

Figure 4 Panel A shows the impulse response functions for this VAR system. The left graph shows that an increase in risk differential forecasts an increase in risk premia differential. Therefore, risk premia responds to risk. The right panel shows a response in differential risk measure to an increase in risk premia differential. A higher risk premia differential forecasts an increase in risk differential. A feedback loop thus exists between the risk premia differential and the differential risk metric.

As a robustness check, we re-estimate the VAR by adding a measure of economic conditions, the unemployment (UNEMPL), to the financial measure of risk differential. Inclusion of the unemployment variable does not change the previously reported results. Figure 4 Panel B shows impulse response functions for this VAR system. We find that the differential in risks and unemployment both have an important affect in the risk premia differential.

Having established the connection between the risk premia differential and several economic variables in a simple setting, we now proceed to incorporate more variables simultaneously in a parsimonious model.

We estimate a VAR system that includes five variables: (1) risk premia differential (RISKDIFF); (2) a measure of corporate profitability—a percent change in forward earnings per share (PCTEPS); (3) risk differential measured as the difference in standard deviations (DIFFSTDEV); (4) unemployment rate (UNEMPL); and (5) CMBS issuance as a proxy for capital supply conditions. Figure 5 shows impulse response functions for the response in risk premia differential to a change to variables in the system. The results indicate that the risk premia differential is autoregressive (first row, left graph), the risk premia differential falls when higher earnings are expected (first row, right), an increase in risk results in higher risk premia differential (second row, left), and an increase in unemployment represents a deterioration of economic conditions and forecasts an increase in risk premia differential.[15] We also find that a positive shock in CMBS issuance, indicating an inflow of funds through a higher CMBS issuance and increasing capital availability, results in a lower risk premia differential.

Next, we add two variables that measure the demand for hotel services into our existing VAR system. The hotel industry variables are total hotel revenues (HOTREVYR) and total hotel demand (HOTDMNDYR). We also exclude two existing variables - risk differential (DIFFSTDEV) and unemployment rate (UNEMPL) – from the system. The rationale is that DIFFSTDEV and UNEMPL could contain the same information as a more direct measure of hotel industry performance proxied by HOTREVYR and HOTDMNDYR. We will explore this relationship more fully in a subsequent VAR impulse response function analysis. The impulse response functions (IRFs) for this VAR system are shown in Figure 6.

Figure 6 reveals that all of our existing variables in our previous VAR system continue to behave in a similar manner. The risk premia differential series is still autoregressive. The risk premium charged for hotel loans declines when aggregate earnings environment is expected to improve and as funding becomes available through CMBS issuance and capital supply increases. There are also several new insights in Figure 6. The third graph in the first row indicates that an increase in hotel revenues forecasts a drop in risk premia charged. The third row of Figure 6 shows the response of total hotel revenues (HOTREVYR) to the variables in the system. The first graph indicates that a shock to risk premia differential does not forecast a change in total

[15] To check robustness of the results to the unemployment shock, we estimate the same system but replace the unemployment variable with the employment variable (percent change in total employment). We find that our results are robust to this change.

hotel revenues. The second panel indicates that a shock to expected corporate profitability (PCTEPS) forecasts an increase in hotel revenues. This is consistent with economic intuition that hotel revenues are related to business activity. The third panel in the third row captures autoregressive nature of the hotel revenues. The fourth panel shows that hotel revenues are related to hotel demand, as expected. The fourth row of Figure 6 shows the response of total hotel demand (HOTDMDYR) to the variables in the system. The results are similar to the results for total hotel revenues. In particular we find that risk premia differential does not forecast total hotel demand; and we find that forward EPS forecasts hotel demand. The fifth row of Figure 6 shows the response of CMBS issuance to the variables in the system.

To summarize our new findings: (1) We find that forward looking corporate profitability measure (PCTEPS) forecasts demand for hotel services (HOTREVYR and HOTDMNDYR); and (2) risk premia differential has no power to forecast the hotel demand variables (HOTREVYR and HOTDMDYR).

We next examine the information content incorporated in DIFFSTDEV and UNEMPL relative to HOTREVYR, a more direct metric of hotel industry performance. The new VAR system includes not only the difference in standard deviations (DIFFSTDEV) and unemployment (UNEMPL) as a measure of economic conditions but also hotel revenues (HOTREVYR). Other variables included in the system are percent change in forward EPS (PCTEPS), activity in the hotel CMBS market (CMBSISSU), and our variable of interest, the risk premia differential (RISKDIFF).

Plots of the impulse response functions (IRFs) associated with our new system are shown in Figure 7, Panel A for the Risk Premia Differential to a unit standard deviation change in a particular variable in the system, traced forward over a period of 12 months. This system captures very well the economic dynamics established through the previous analysis. The results are consistent with our prior findings regarding the autoregressive nature of the risk premia differential and the respective roles that improved corporate profitability and increasing CMBS issuance play in lowering the risk premium. The new insight of these plots is that when a direct measure of conditions in the hotel market – hotel revenues (HOTREVYR) – is included in the system, the significance of the two other risk variables declines. The risk differential (DIFFSTDEV) and unemployment (UNEMPL) are no longer significant at 5% level (although they remain significant at the 10% level). In other words, using a direct measure of industry performance, hotel revenues, subsumes the informational role of the less direct measures (risk differential and unemployment).

In Figure 7, Panel B we plot impulse response functions (IRFs) for the Risk Differential (DIFFSTDEV) to a unit standard deviation change in a particular variable, traced forward over a period of 12 months. There are several results of interest to note. An increase in expected profitability (forward earnings) forecasts a decline in risk differential. The risk differential picks up movements in unemployment; an increase in unemployment forecasts an increase in risk differential. An increase in hotel revenues forecasts a significant decline in risk differential. Overall, the results suggest that the risk differential variable contains both information on the economy (unemployment) and industry-specific information. When a direct measure of industry performance (hotel revenues) is included in the VAR system, it captures the role of less direct performance measures. The analysis indicates that the risk differential variable also captures well a variety of state variables, including information on overall economic conditions (unemployment) and industry performance. Thus, the inclusion of the risk differential variable represents a parsimonious way of reflecting information that is important for modeling the variation in the spread.

In this section we studied the dynamics of the spread. We find that the behavior of the spread is consistent with economic intuition and we establish that the differential risk premium is systematically priced. The spread responds to a set of economic variables that contains a measure of financial risk (DIFFSTDEV), a forward looking measure of financial performance (PCTEPS), a measure of overall economic conditions (unemployment, UNEMPL), a measure of capital supply conditions in the industry (CMBSISSU), and industry specific performance information, captured by hotel revenues (HOTREVYR). These variables thus capture risk and return information in the risk premia differential (spread).

Stage 2: Informational Content of the Spread

To study the informational content of the pricing spread we begin with univariate analysis. In efficient capital markets, prices reflect market expectations of risk and return. Markets anticipate future developments and adjust prices for risky assets (the required rate of return on capital) when expected conditions change. In this environment, the risk premia differential may contain important information that is useful for forecasting delinquencies and foreclosures.

We begin by adopting a flexible approach and estimating a VAR system with risk premia differential (RISKDIFF) and delinquency (DELINQ) variables. The VAR system we estimate is,

$$RISKDIFF_t = \sum_{j=1}^{K} \gamma_{1j} \cdot RISKDIFF_{t-j} + \sum_{j=1}^{K} \delta_{1j} \cdot DELINQ_{t-j} + u_t$$

$$DELINQ_t = \sum_{j=1}^{K} \gamma_{2j} \cdot RISKDIFF_{t-j} + \sum_{j=1}^{K} \delta_{2j} \cdot DELINQ_{t-j} + v_t$$

In accordance with the Akaike information criterion (AIC) and Schwarz Bayesian information criterion (BIC), we estimate the VAR system with 2 lags. Figure 8 plots impulse response functions (IRFs) for this VAR system. The left panel indicates that the risk premia differential does not increase in response to a shock in delinquencies (the zero level is within the standard error band, so the response in to statistically different from zero). In other words, past delinquencies do not forecast increases in the interest rate differential. The right panel indicates that a shock to the risk premia differential forecasts an increase in delinquencies with a lag of approximately three months (the right panel of the figure shows a significant positive response). These results are consistent with efficient markets: market prices anticipate future deterioration in cash flows, rather than respond to them with a lag. Our findings thus indicate that the risk premia differential contains important information regarding future relative levels in delinquencies.

We also report the results of the regression of the risk premia differential (RISKDIFF) on the past level of relative delinquencies in the hotel and office mortgage-backed securities (DELINQ). Lagged values of the dependent and independent variables are included to control for serial correlation in the data.

$$RISKDIFF_t = \underset{(2.05)^{**}}{0.042} + \underset{(22.70)^{***}}{0.930} \cdot RISKDIFF_{t-1} + \underset{(1.52)}{0.018} \cdot DELINQ_t - \underset{(-1.63)}{0.019} \cdot DELINQ_{t-1}$$

The Durbin-Watson statistic is 2.05. The variable of interest is $DELINQ_t$. The regression coefficient for this variable is not significant. We also estimate this regression with the lagged delinquency variable (we perform regressions with $DELINQ_{t-1}$, or $DELINQ_{t-2}$). The results are similar. These results are consistent with the results from the VAR (Figure 8, left panel).

Next, we estimate the following regression,

$$DELINQ_t = -\underset{(-2.75)^{**}}{0.404} + \underset{(2.97)^{***}}{1.67} \cdot RISKDIFF_{t-2} - \underset{(-0.87)}{0.52} \cdot RISKDIFF_{t-3} + \underset{(37.96)^{***}}{0.92} \cdot DELINQ_{t-1}$$

The Durbin-Watson statistic is 1.66. The variable of interest is the lagged measure of the risk premia differential ($RISKDIFF_{t-2}$); the other variables are included in the regression to control for serial correlation. The results suggest that the risk premia differential is a predictor of the relative level of delinquencies. The results of this regression are consistent with the results from the VAR (Figure 8, right panel). We find that risk premia differential contains important information for predicting delinquencies.

To check the robustness of the above result, we include more lags and estimate the regression,

$$\begin{aligned} DELINQ_t = & -\underset{(-3.02)^{**}}{0.454} + \underset{(2.79)^{***}}{1.54} \cdot RISKDIFF_{t-2} - \underset{(-2.23)^{**}}{1.67} \cdot RISKDIFF_{t-3} + \underset{(2.43)^{**}}{1.43} \cdot RISKDIFF_{t-4} \\ & + \underset{(12.98)^{***}}{1.08} \cdot DELINQ_{t-1} - \underset{(-2.18)^{**}}{0.17} \cdot DELINQ_{t-2} \end{aligned}$$

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

Multivariate Analysis

Having established that the risk premia differential has predictive power for delinquencies in a single variate setting, we proceed with multivariate analysis. Our goal is to explore inter-temporal associations between loan delinquencies, economic and financial conditions, and risk premia differential. We estimate the following VAR system,

$$
\begin{aligned}
RISKDIFF_t \quad &= \quad \sum_{j=1}^{K}\gamma_{1j}RISKDIFF_{t-j} + \sum_{j=1}^{K}\alpha_{1j}DIFFSTDEV_{t-j} + \sum_{j=1}^{K}\beta_{1j}PCTEPS_{t-j} \\
&+ \quad \sum_{j=1}^{K}\lambda_{1j}UNEMPL_{t-j} + \sum_{j=1}^{K}\delta_{1j}DELINQ_{t-j} + u_t \\
DIFFSTDEV_t \quad &= \quad \sum_{j=1}^{K}\gamma_{2j}RISKDIFF_{t-j} + \sum_{j=1}^{K}\alpha_{2j}DIFFSTDEV_{t-j} + \sum_{j=1}^{K}\beta_{2j}PCTEPS_{t-j} \\
&+ \quad \sum_{j=1}^{K}\lambda_{2j}UNEMPL_{t-j} + \sum_{j=1}^{K}\delta_{2t}DELINQ_{t-j} + w_t \\
PCTEPS_t \quad &= \quad \sum_{j=1}^{K}\gamma_{3j}RISKDIFF_{t-j} + \sum_{j=1}^{K}\alpha_{3j}DIFFSTDEV_{t-j} + \sum_{j=1}^{K}\beta_{3j}PCTEPS_{t-j} \\
&+ \quad \sum_{j=1}^{K}\lambda_{3j}UNEMPL_{t-j} + \sum_{j=1}^{K}\delta_{3t}DELINQ_{t-j} + y_t \\
UNEMPL_t \quad &= \quad \sum_{j=1}^{K}\gamma_{4j}RISKDIFF_{t-j} + \sum_{j=1}^{K}\alpha_{4j}DIFFSTDEV_{t-j} + \sum_{j=1}^{K}\beta_{4j}PCTEPS_{t-j} \\
&+ \quad \sum_{j=1}^{K}\lambda_{4j}UNEMPL_{t-j} + \sum_{j=1}^{K}\delta_{4j}DELINQ_{t-j} + z_t \\
DELINQ_t \quad &= \quad \sum_{j=1}^{K}\gamma_{5j}RISKDIFF_{t-j} + \sum_{j=1}^{K}\alpha_{5j}DIFFSTDEV_{t-j} + \sum_{j=1}^{K}\beta_{5j}PCTEPS_{t-j} \\
&+ \quad \sum_{j=1}^{K}\lambda_{5j}UNEMPL_{t-j} + \sum_{j=1}^{K}\delta_{5j}DELINQ_{t-j} + v_t
\end{aligned}
$$

In accordance with the Akaike information criterion (AIC) and Schwarz Bayesian information criterion (BIC), we estimate the VAR system with 2 lags.

We now examine the impulse response functions (IRFs) for the VAR system. The top row of graphs in Figure 9 shows the response of the risk premia differential to shocks in the state variables. The first panel (top row, left graph) shows that a shock to the risk differential forecasts a positive change to risk premia differential – a higher risk differential forecasts a higher incremental compensation for risk. The second graph in the top row shows that a shock to forward expected EPS results in a lower risk premia differential. This result is consistent with the view that during relatively good times – higher earnings – the spreads narrow. The next panel indicates that a shock to unemployment forecasts an increase in the risk premia differential. The last figure in the top row shows the response of the risk premia differential to a shock in relative delinquencies. The impulse response function indicates that the risk premia differential does not increase in response to past delinquencies.

We now examine the second row of Figure 9. It plots IRFs for delinquencies as a response variable. The first figure indicates that in a multivariate VAR system a shock to the risk premia differential forecasts an increase in delinquencies. This is our main result. It shows that when the effect of other financial and economic variables on delinquencies has already been taken into account in a system, the risk premia differential remains an important variable forecasting a change in delinquency levels. The next graph in the bottom row shows that an increase in risk differential forecasts an increase in delinquencies. This result provides a connection between risk as measured by financial market variables and future delinquencies. Another financial variable in the system is forward EPS. A shock (an increase) to a forward EPS forecasts a decrease in delinquencies, albeit after a longer lag. Finally, the last plot shows that a shock to unemployment forecasts an increase in delinquencies.

Given our results in a VAR setting, we next perform multivariate time series regressions. Results of the regressions are reported in Table 2. Each column represents a different regression specification. The dependent variable is the level of delinquencies, $DELINQ_t$. 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 specification includes the following explanatory variables: risk premia differential[16] ($RISKDIFF_{t-6}$), difference in risk ($DIFFSTDEV_{t-4}$), and unemployment ($UNEMPL_{t-8}$). Our findings are consistent with the VAR analysis. First, we find that the risk premia differential is an important variable for forecasting delinquencies. In the regressions, the risk

[16] 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.

premia differential (*$RISKDIFF_{t-6}$*) has a positive coefficient (coefficient value of 1.146, t-statistic of 2.01) indicating that an increase in the risk premia spread forecasts an increase in delinquencies. Second, we find that an increase in risk, as captured by the difference in standard deviations (*$DIFFSTDEV_{t-4}$*), forecasts an increase in delinquencies. Third, we find that worsening economic conditions - as captured by the unemployment variable - predicts an increase in delinquencies.

The second specification differs from the first specification in two ways. We study the difference in risk variable with a longer lag (*$DIFFSTDEV_{t-6}$*) and we use the percent change in total employment (*$EMPL_{t-9}$*) instead of the unemployment variable. The results of this specification are fully consistent with the results from the first specification.

In the third specification (Table 2, third column) we add a forward looking financial variable to the regression. We include the percent change in forward S&P500 earnings per share. We find that this variable is not significant in forecasting delinquencies, but the behavior of other predictors does not change after we control for this forward-looking financial measure.

Overall, the results of time series regressions are fully consistent with the results from VAR analysis and indicate that differential risk premia for hotels is an important variable for forecasting hotel delinquencies.

Conclusion

We use a two stage process to investigate how the length of the lease contract affects the pricing of loan risk. Shorter term leases such as those associated with hotels e.g., a room for a night should exhibit a greater sensitivity to changes in fundamental factors which in turn should increase the loan pricing of risk (higher interest rates) on this property type relative to longer term leases associated with other property types such as office real estate where the rents are fixed over a longer time horizon say five to ten years e.g., these leases can't be marked to market instantaneously. Using a VAR framework, we thus examine the dynamics of the incremental hotel risk premium (hotel interest rate – office interest rate) to assess the extent to which fundamental factors are incorporated into the loan pricing of hotels. These factors include the state of the economy, expected corporate profitability, as well as capital market and real estate market conditions. Next, we examine the signaling implications of widening or tightening incremental hotel risk premium.

We find that the differential risk premium for hotels is systematically priced. This is the primary contribution of our study. In particular, a deterioration of general economic conditions, a decline in expected corporate profitability, a reduction in capital availability and/or a decrease in the demand for hotel services are catalysts resulting in a rise in the hotel risk premium differential. We also show that changes in the risk differential and unemployment incorporate information on the direction of hotel revenues, a direct measure of industry performance. In addition to this, we demonstrate that the relative risk premia of hotel rates above office property rates contains important information for forecasting hotel delinquencies. However, the converse situation doesn't hold e.g., the risk premium differential does not increase in response to a shock in delinquencies. Hotel credit spreads widen when lenders anticipate higher hotel delinquencies and narrow during expected hotel prosperity. We also find that an increase in the volatility of hotel REIT returns or risk (as measured by standard deviation of returns) and a change in economic conditions as captured by unemployment have forecasting power for hotel delinquencies and foreclosures. More importantly, even when we control for the effect of other financial and economic variables on delinquencies in our VAR model, the risk premium differential remains an important variable for forecasting a change in delinquency levels. This is our main result in the second stage.

Appendix A

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 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. DIFFSTDEV = $\sigma_{Hotel} - \sigma_{Office}$. Source: National Association of Real Estate Investment Trusts[17]
Differential Risk Premia (RISKDIFF)	Difference in the spread at time of origination (SATO) between hotel and office property types; additional risk premia associated with hotel. Source: Lehman Brothers, Cushman & Wakefield (http://www2.cushwake.com/sonngold/)
Percent Change (Growth Rate) in Total Employment (EMPL)	Change in the number of employed persons from period to period. Source: U.S. Bureau of Labor Statistics (BLS) (via http://www.economy.com/freelunch)
Percent Change in Forward Earnings per Share (PCTEPS)	PctEPS = $(EEPS_t/EEPS_{t-1}) - 1$. Where EEPS is Forward Earnings per Share, analysts *estimates* of earnings per share for the S&P500. This is anticipated profits in contrast to actual corporate profits (see Corporate profits (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. Source: U.S. Bureau of Labor Statistics (BLS) (via http://www.economy.com/freelunch)
Hotel Revenues Year-over-Year (HOTREVYR)	Year over year percentage change in total hotel revenues (all hotel classes). Source: Smith Travel Research
Hotel Demand Year-over-Year (HOTDMDYR)	Year over year percentage change in total hotel demand (all hotel classes). Source: Smith Travel Research
CMBS Issuance trailing twelve months (CMBSISSU)	Trailing twelve months CMBS Issuance. Source: CRE Finance Council, Compendium of Statistics[18] (original source of data is Commercial Mortgage Alert)

[17] http://www.reit.com/IndustryDataPerformance/IndustryDataPerformance.aspx
[18] http://www.crefc.org/uploadedFiles/CMSA_Site_Home/Industry_Resources/Research/Industry_Statistics/CMSA_Compendium.pdf

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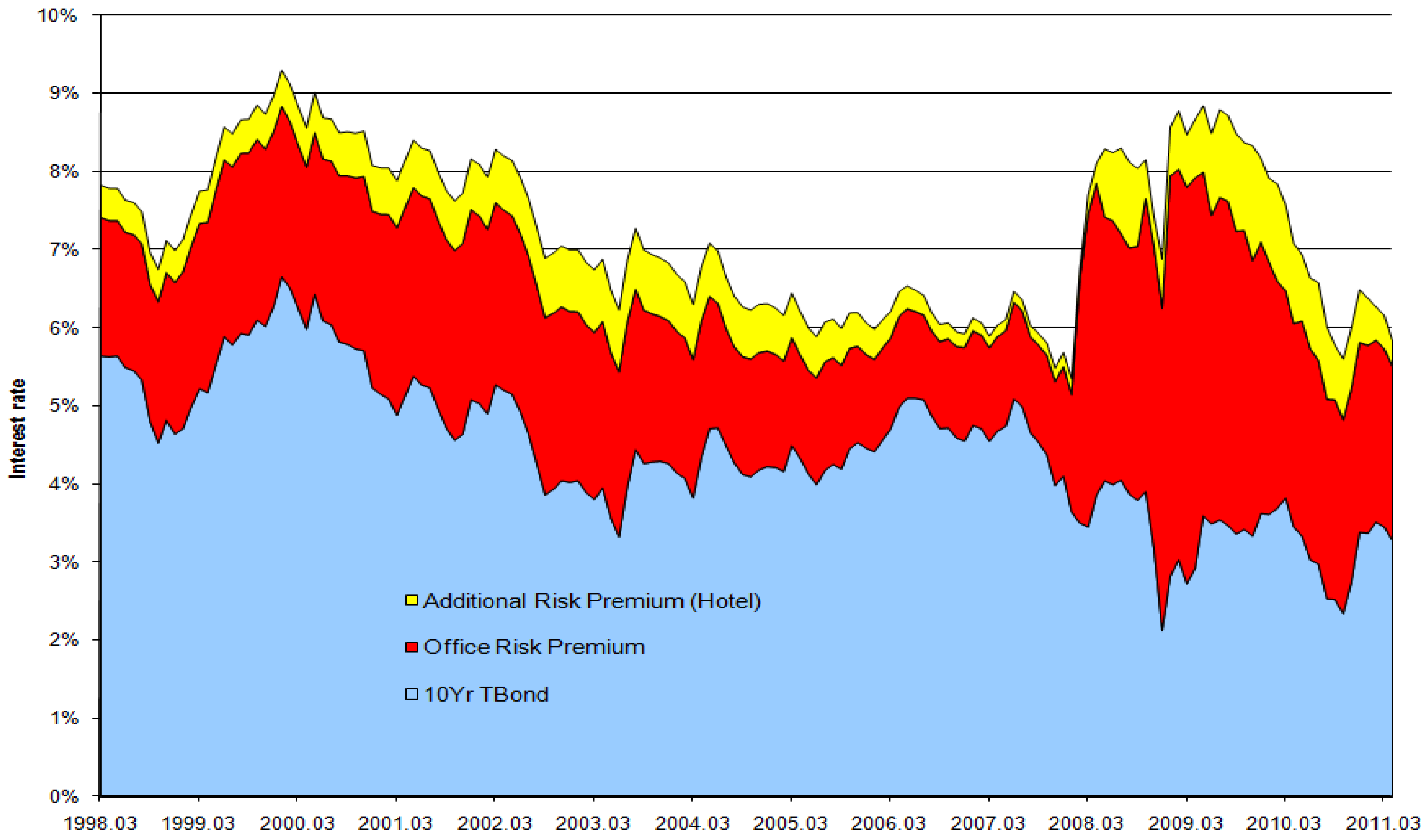
Figure 1. Incremental Interest Rate Components for Hotels



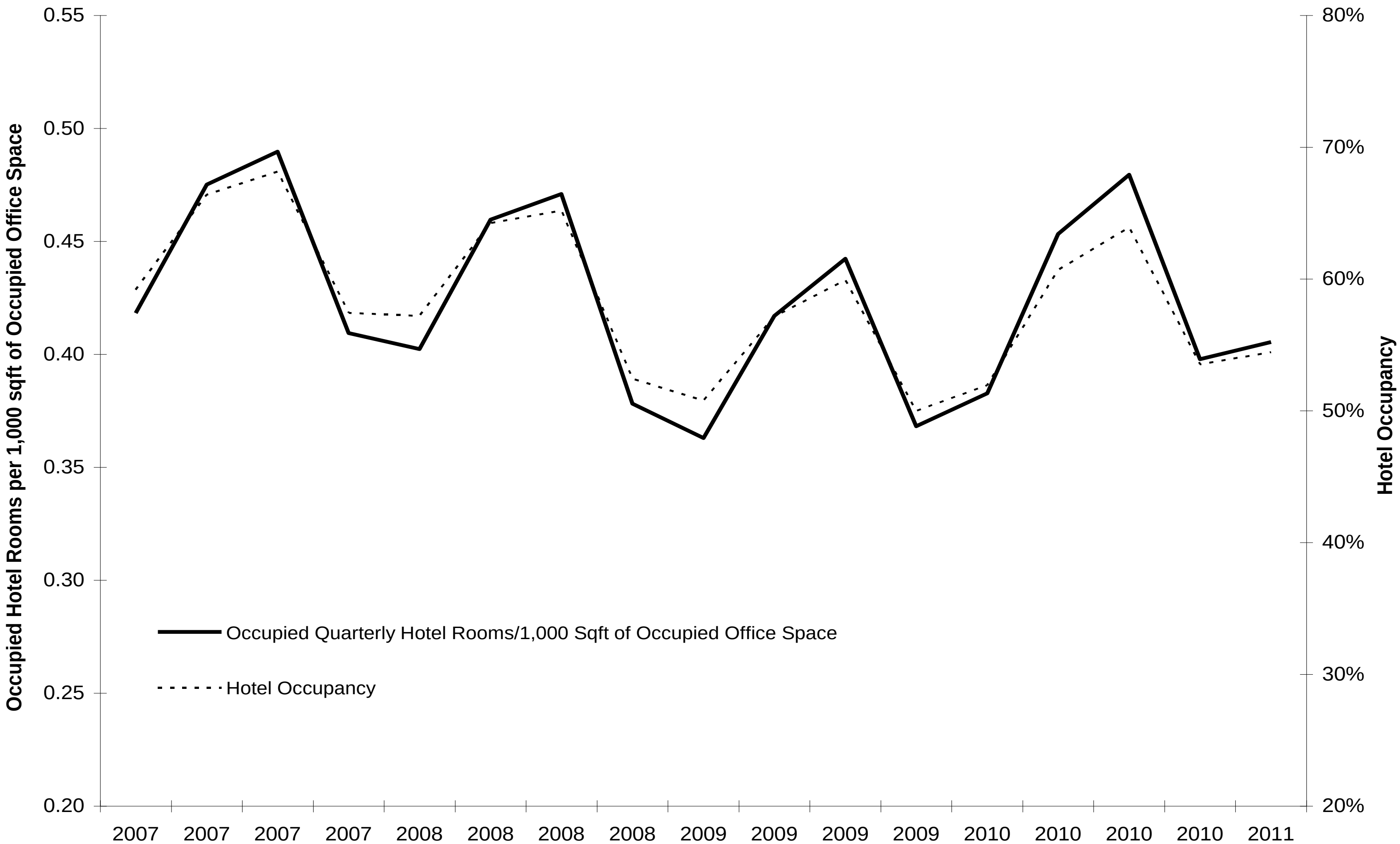
Source: Federal Reserve, Cushman & Wakefield Sonnenblick Goldman, Lehman Brothers

Table 1: Annual Historic Office and Hotel Statistics for the U.S.

	Occupied Office Space (SqFt)	Occupied Hotel Rooms	Occupied Quarterly Hotel Rooms/1,000 Sqft of Occupied Office Space	Hotel Occupancy
2007.01	6,246,369,322	2,612,739	0.418	59.18%
2007.02	6,272,398,072	2,979,804	0.475	66.40%
2007.03	6,291,437,945	3,080,636	0.490	68.14%
2007.04	6,310,865,626	2,583,462	0.409	57.43%
2008.01	6,404,676,813	2,576,247	0.402	57.19%
2008.02	6,415,999,751	2,948,808	0.460	64.24%
2008.03	6,420,290,066	3,023,557	0.471	65.17%
2008.04	6,424,207,600	2,428,971	0.378	52.44%
2009.01	6,498,233,931	2,358,258	0.363	50.77%
2009.02	6,479,793,802	2,702,001	0.417	57.14%
2009.03	6,472,606,426	2,863,034	0.442	59.90%
2009.04	6,472,629,295	2,382,677	0.368	49.99%
2010.01	6,468,198,932	2,475,435	0.383	51.94%
2010.02	6,473,022,457	2,933,683	0.453	60.68%
2010.03	6,478,754,340	3,106,465	0.479	63.91%
2010.04	6,497,800,746	2,584,680	0.398	53.52%
2011.01	6,503,161,650	2,636,248	0.405	54.44%
		Average	0.424	
		StDev	0.041	
		Correlation		0.978

Source: CoStar, Smith Travel Research

Figure 2: Historical Relationship between Office and Hotel Occupancies for the U.S. as a whole



Source: CoStar, Smith Travel Research

Figure 3: The Risk in the Risk Premium (Another Perspective):
The Difference in Standard Deviations of Hotel and Office Returns

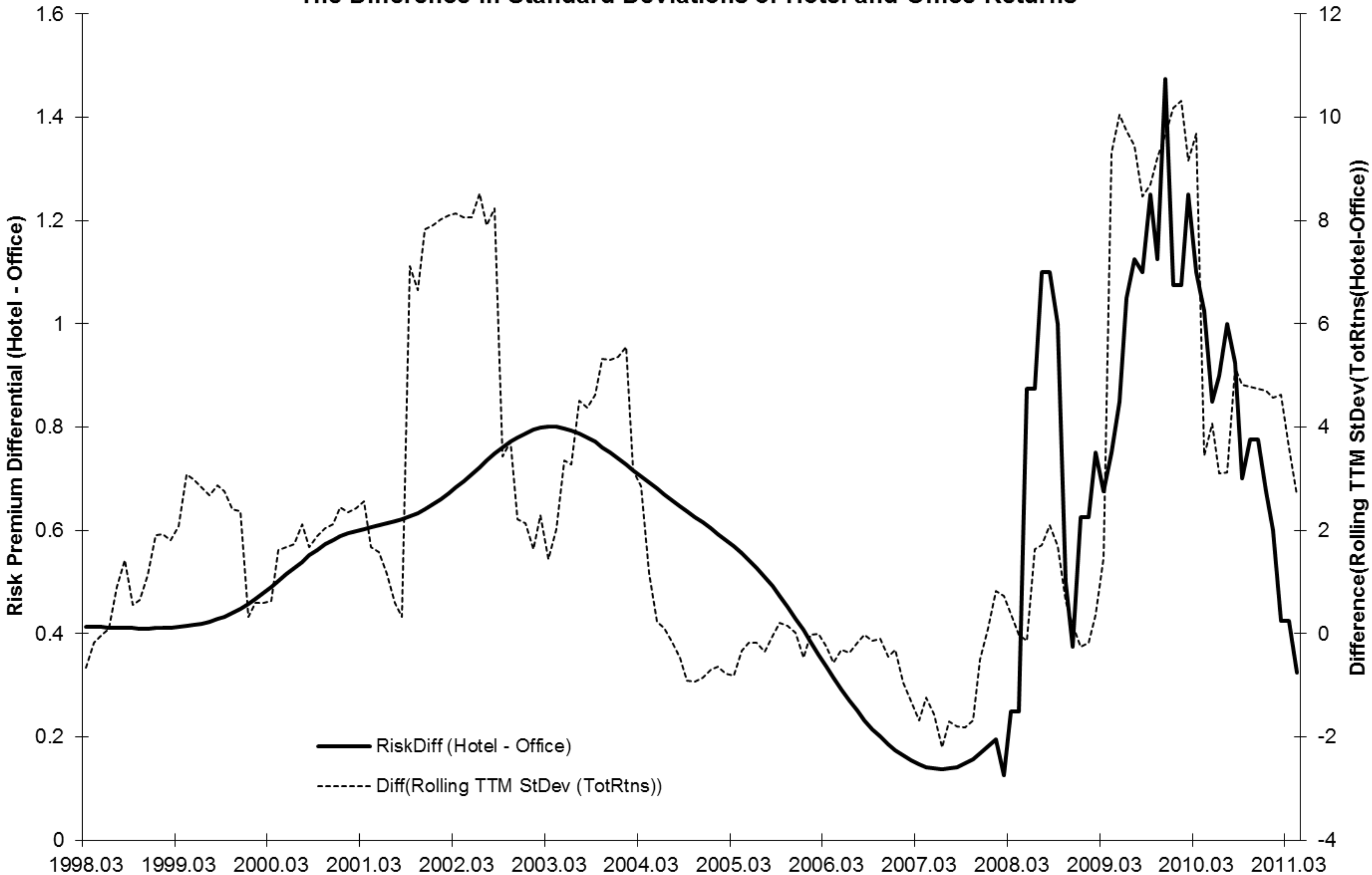
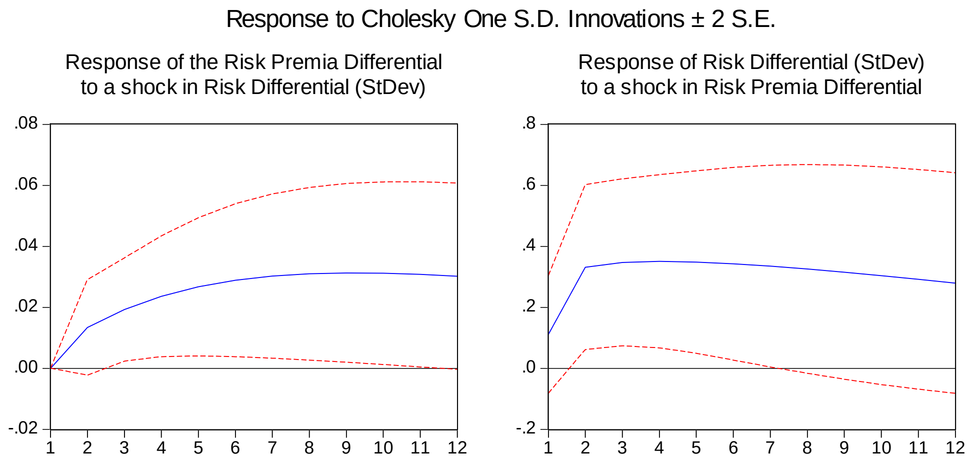


Figure 4

In Figure 4, Panel A we plot impulse response functions (IRFs) for the Risk Premia Differential and difference in standard deviations (DIFSTDEV) to a unit standard deviation change in a particular variable, traced forward over a period of 12 months. Response to Cholesky 1 standard deviation. Dashed lines represent 95% confidence bands. Panel B contains IRFs for a VAR system that adds unemployment.

Panel A: Risk Premia Differential and Differential in Risk



Panel B: Risk Premia Differential, Differential in Risk, and Unemployment

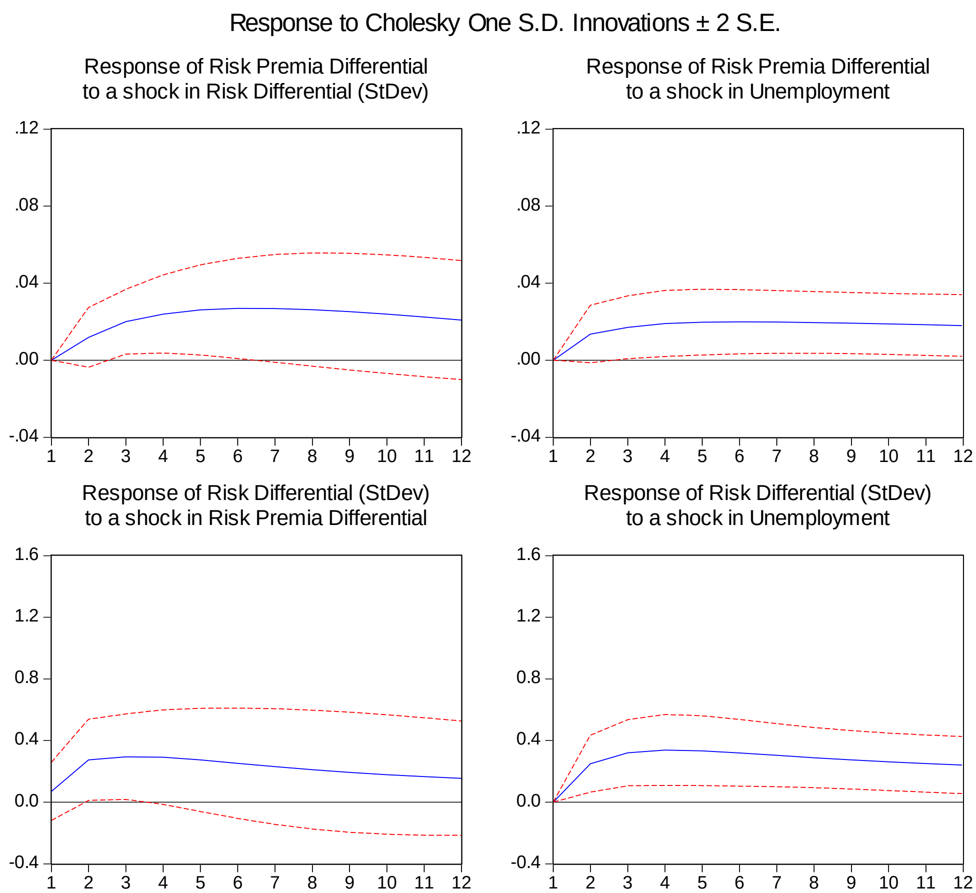


Figure 5

In Figure 5 we plot impulse response functions (IRFs) for the Risk Premia Differential to a unit standard deviation change in a particular variable, traced forward over a period of 12 months. Response to Cholesky 1 standard deviation. Dashed lines represent 95% confidence bands. The VAR system contains five variables: (1) risk premia differential (RISKDIFF); (2) a percent change in forward earnings per share (PCTEPS); (3) risk differential (DIFFSTDEV); (4) unemployment rate (UNEMPL); and (5) CMBS issuance.

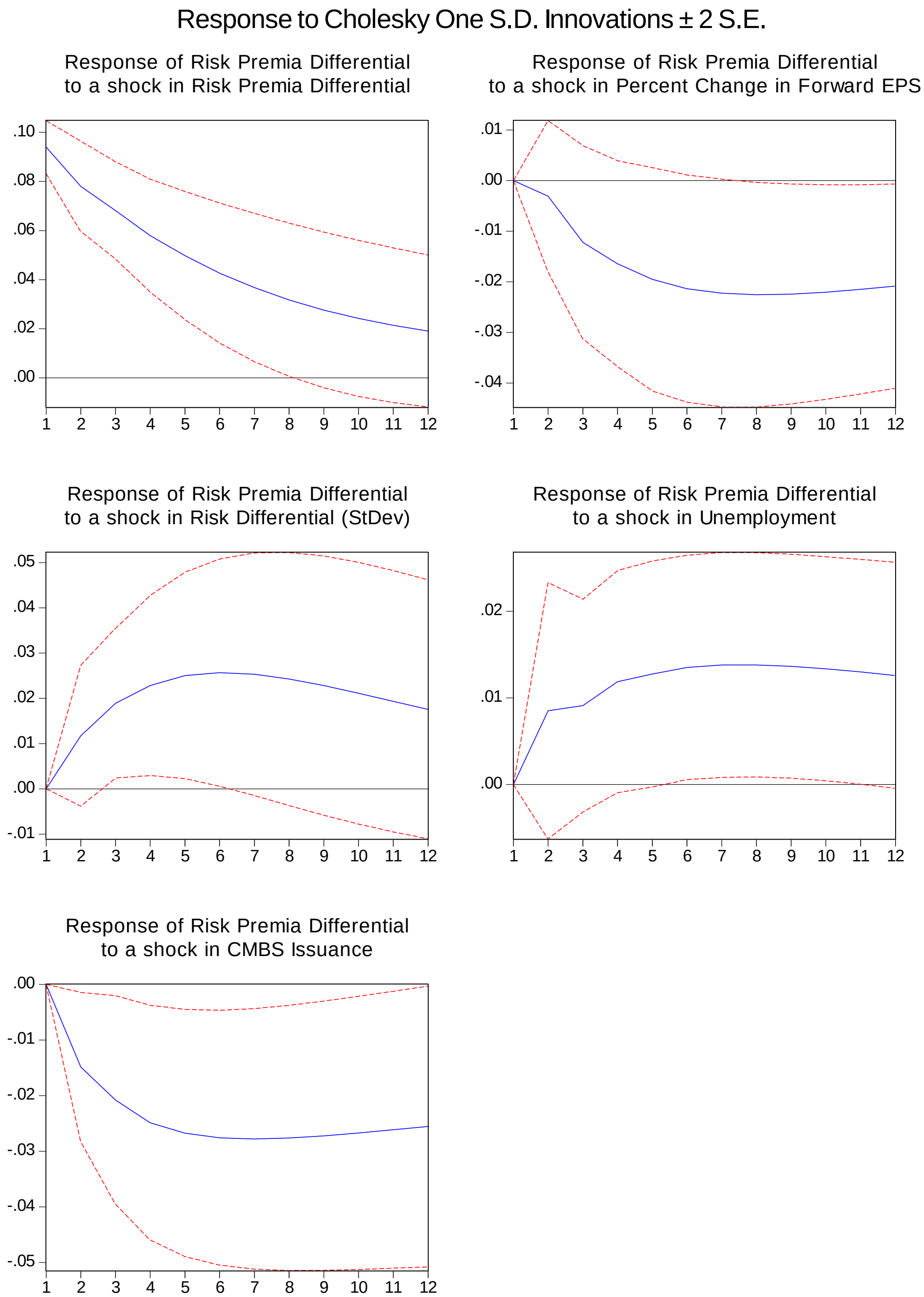


Figure 6: Risk Premia and Industry Conditions

In Figure 6, we plot impulse response functions (IRFs) for the Risk Premia Differential to a unit standard deviation change in a particular variable, traced forward over a period of 12 months. Response to Cholesky 1 standard deviation. Dashed lines represent 95% confidence bands.

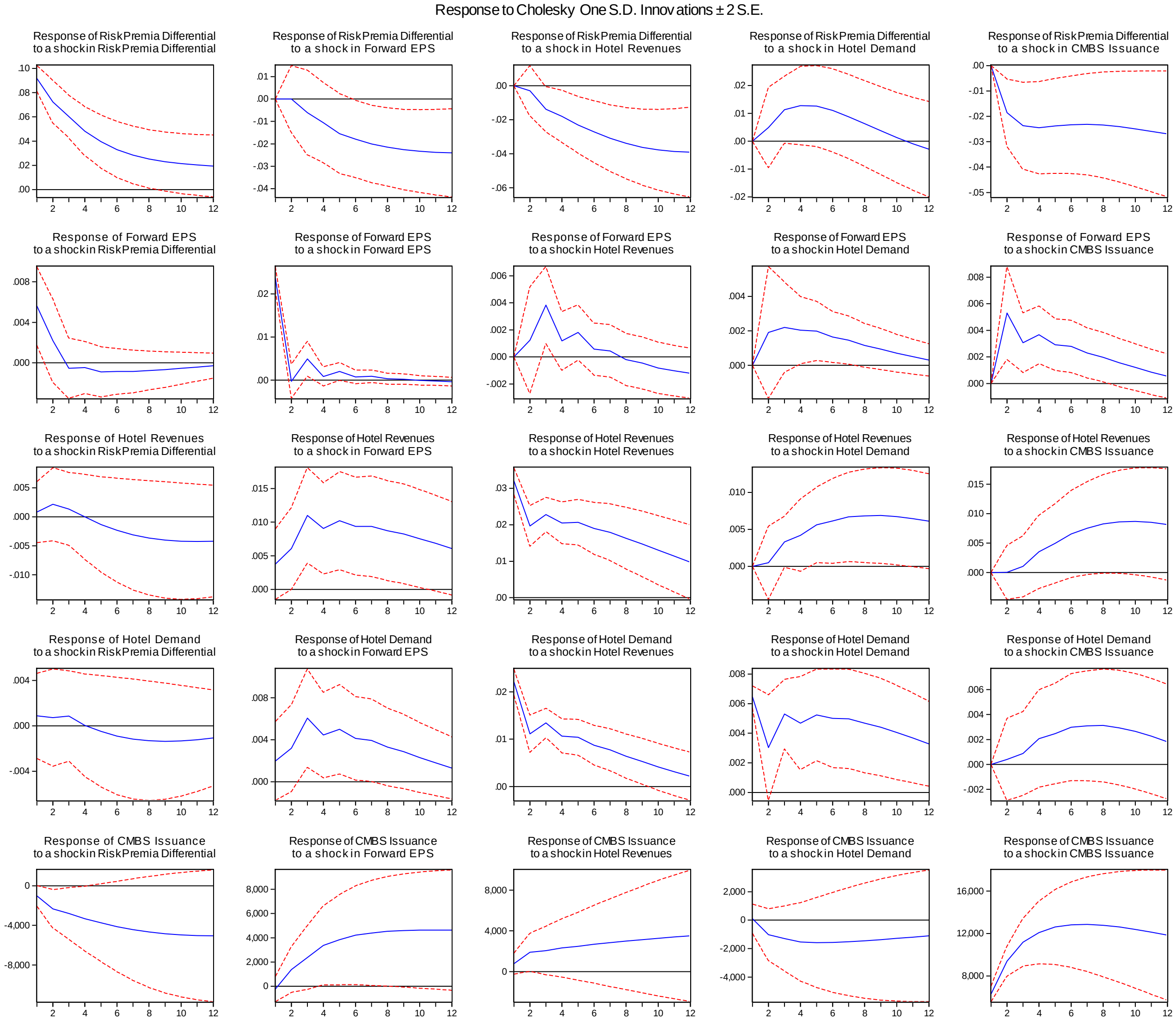
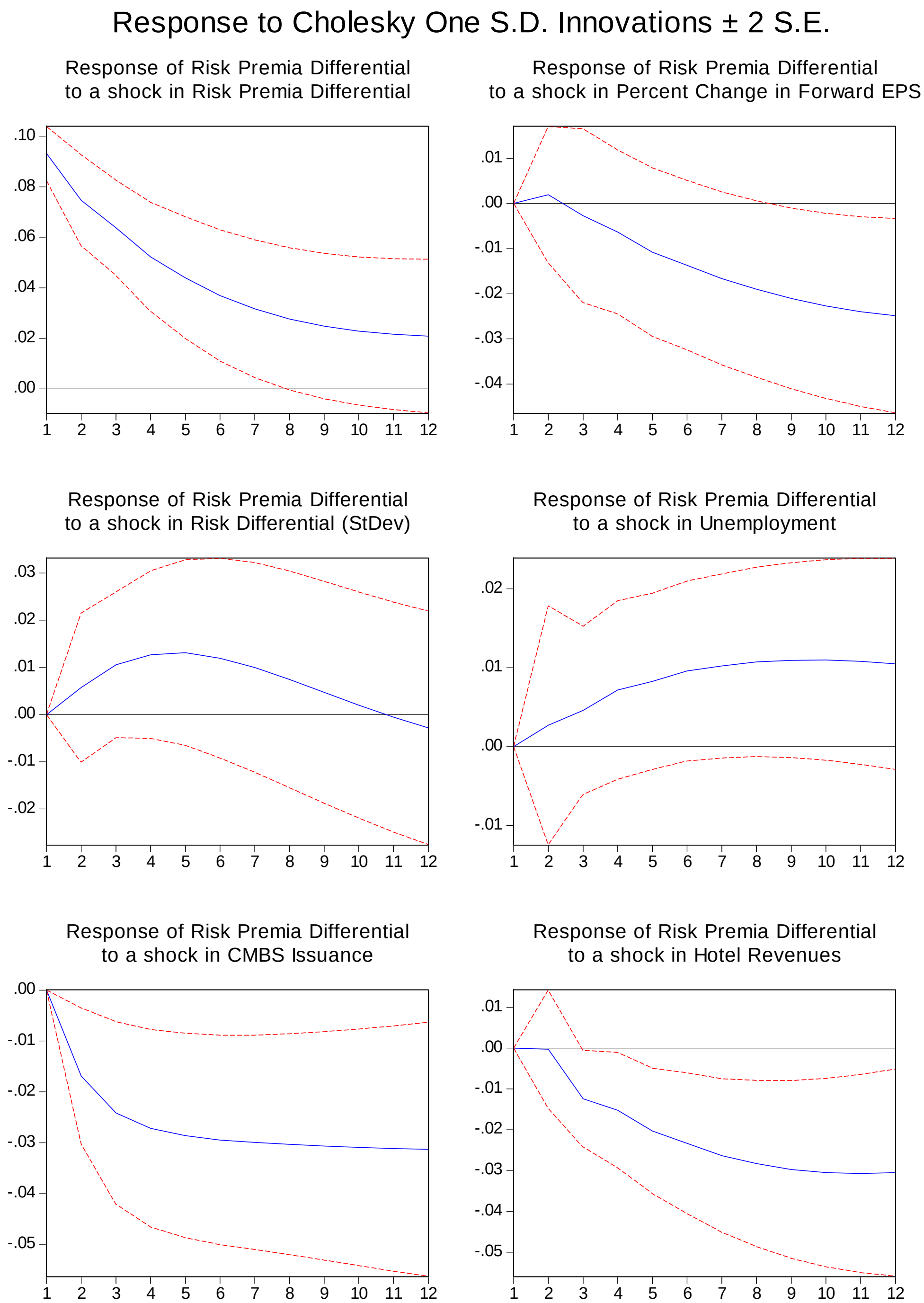


Figure 7

In Figure 7, Panel A we plot impulse response functions (IRFs) for the Risk Premia Differential to a unit standard deviation change in a particular variable, traced forward over a period of 12 months. Response to Cholesky 1 standard deviation. Dashed lines represent 95% confidence bands.



In Figure 7, Panel B we plot impulse response functions (IRFs) for the Risk Differential to a unit standard deviation change in a particular variable, traced forward over a period of 12 months. Response to Cholesky 1 standard deviation. Dashed lines represent 95% confidence bands.

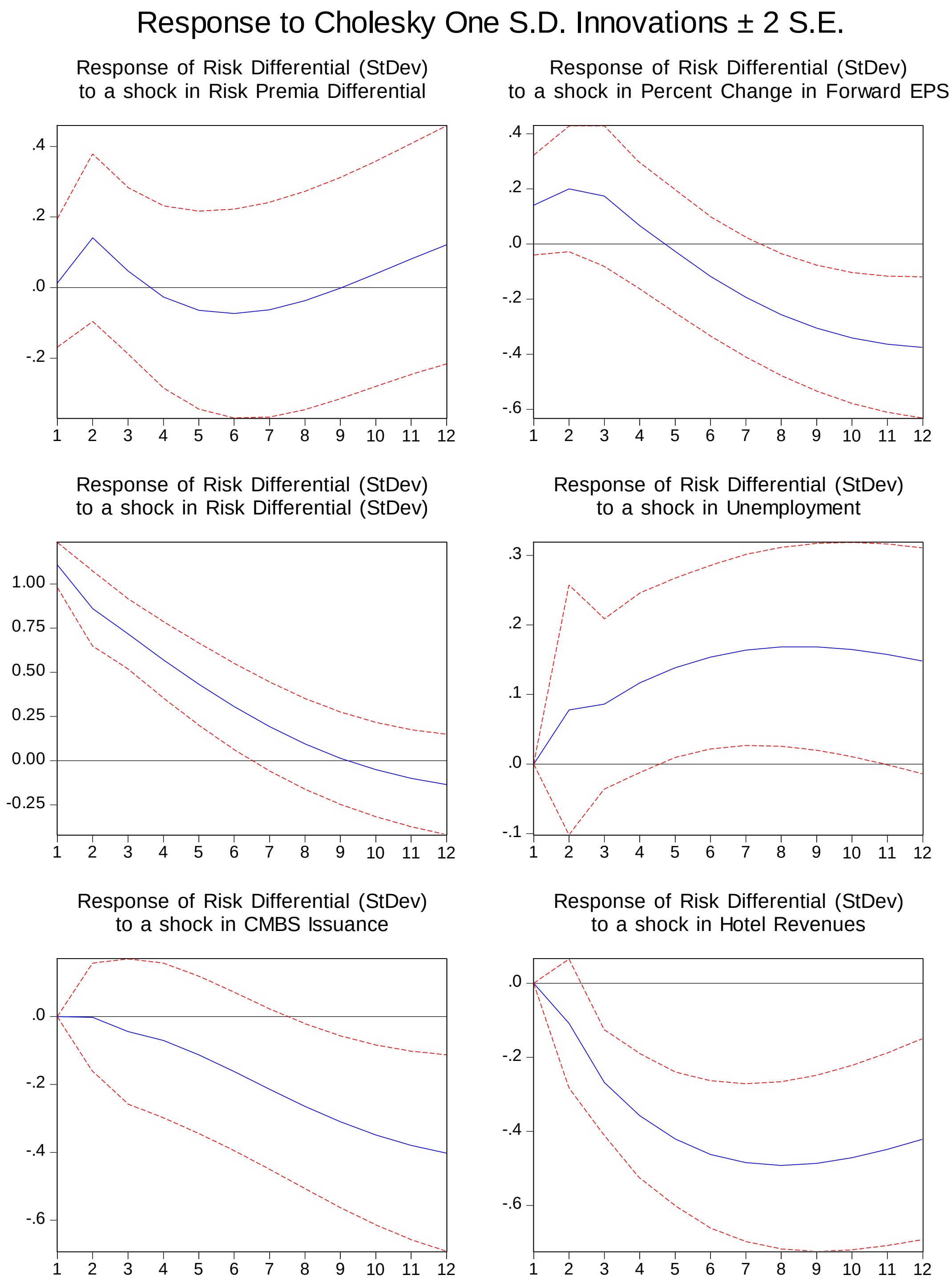


Figure 8
In Figure 8, we plot impulse response functions (IRFs) for the Risk Premia Differential and relative delinquency rate to a unit standard deviation change in a particular variable, traced forward over a period of 12 months. Response to Cholesky 1 standard deviation. Dashed lines represent 95% confidence bands.

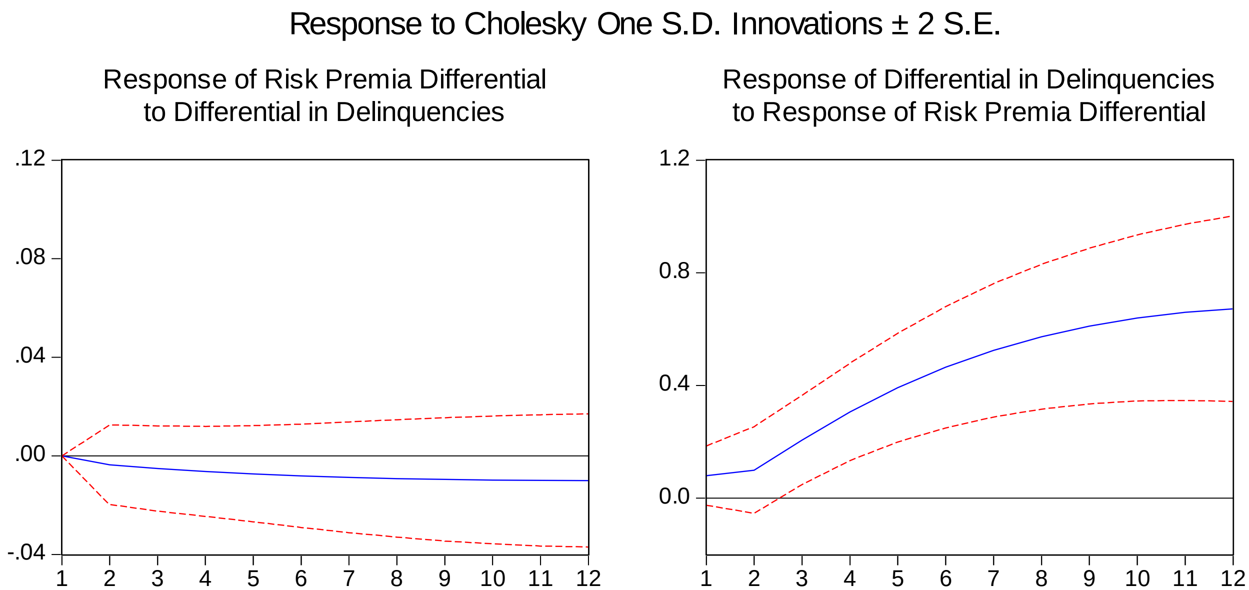


Figure 9

In Figure 9, we plot impulse response functions (IRFs) for the Risk Premia Differential (top row) and relative delinquency rate (second row) to a unit standard deviation change in a particular variable, traced forward over a period of 12 months. Response to Cholesky 1 standard deviation. Dashed lines represent 95% confidence bands. The variables included in the VAR system are: the differential risk premia (RISKDIFF), difference in standard deviations (DIFSTDEV), unemployment rate (UNEMPL), percent change in forward earnings per share (PCTEPS), and relative delinquency rate (DELINQ).

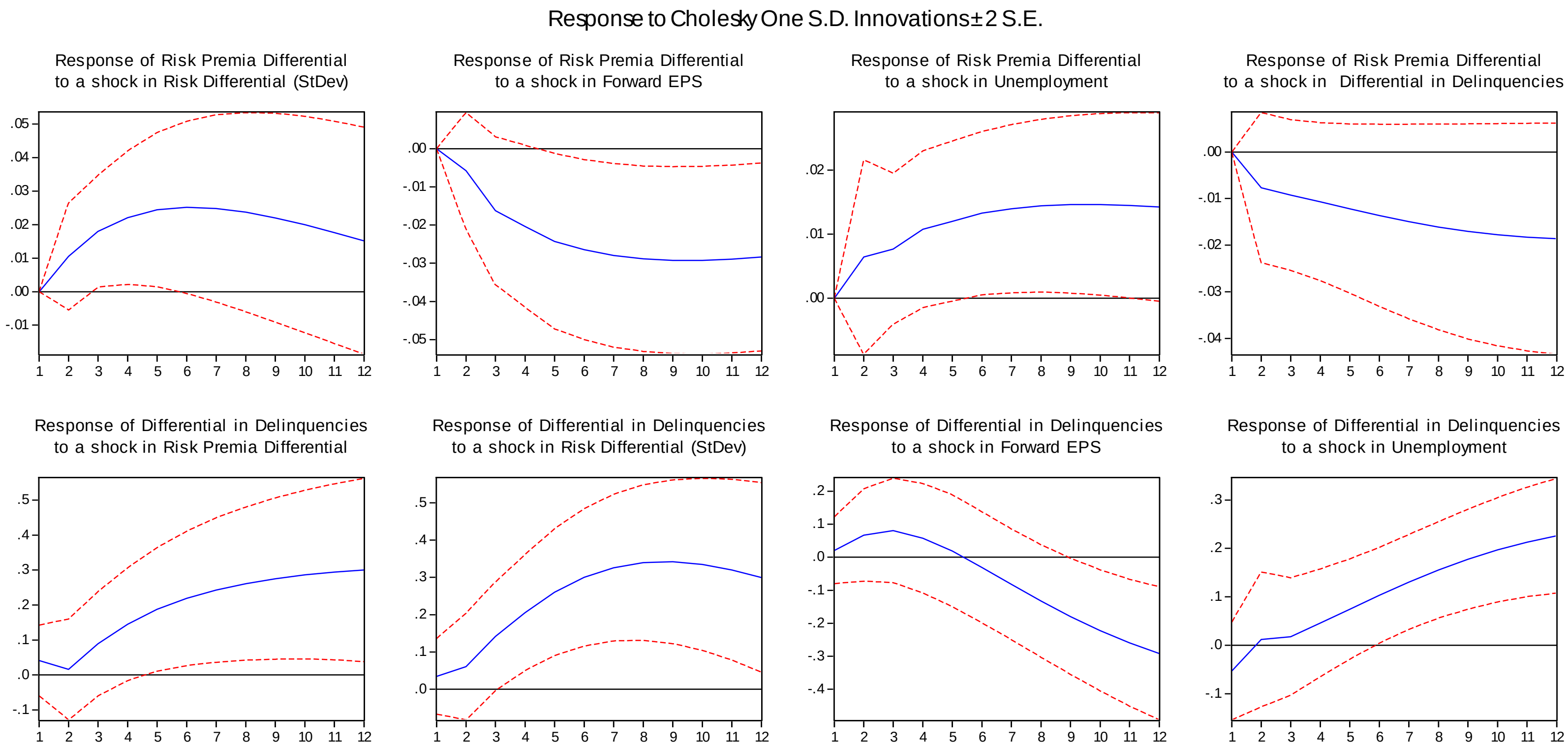


Table 2

The table shows time series regressions of relative delinquency rate, DELINQ, on several predictors: the differential risk premia (RISKDIFF), difference in standard deviations (DIFSTDEV), unemployment rate (UNEMPL), percent change (growth rate) in total employment (EMPL), percent change in forward earnings per share (PCTEPS). The variables of interest are highlighted in bold. Lagged values of the dependent and independent variables are included to control for serial correlation the data. t-statistic is shown in parentheses below the coefficient estimates.

	DELINQ(t)	DELINQ(t)	DELINQ(t)	DELINQ(t)
Intercept	-0.728	0.158	-0.729	0.126
	(-2.35)**	(0.92)	(-2.32)**	(0.69)
DELINQ(t-1)	0.899	0.892	0.894	0.879
	(10.49)***	(9.98)***	(10.23)***	(9.58)***
DELINQ(t-2)	-0.084	0.010	-0.080	0.010
	(-0.99)	(0.12)	(-0.93)	(0.12)
RISKDIFF(-6)	**1.146**	**0.966**	**1.186**	**0.997**
	(2.01)**	**(1.74)***	**(2.05)****	**(1.76)***
RISKDIFF(-7)	-0.481	-0.301	-0.448	-0.199
	(-0.65)	(-0.41)	(-0.59)	(-0.27)
RISKDIFF(-8)	-0.707	-0.476	-0.761	-0.507
	(-1.22)	(-0.82)	(-1.26)	(-0.84)
DIFFSTDEV(-4)	**0.075**		**0.072**	
	(1.68)*		**(1.60)**	
DIFFSTDEV(-5)	-0.088		-0.088	
	(-1.48)		(-1.45)	
DIFFSTDEV(-6)	0.127		0.129	
	(2.75)***		(2.74)***	
DIFFSTDEV(-6)		**0.138**		**0.133**
		(2.98)***		**(2.80)*****
DIFFSTDEV(-7)		0.007		0.010
		(0.11)		(0.16)
DIFFSTDEV(-8)		-0.106		-0.104
		(-2.28)**		(-2.17)**
UNEMPL(-8)	**0.707**		**0.700**	
	(1.94)**		**(1.85)****	
UNEMPL(-9)	-0.100		-0.089	
	(-0.19)		(-0.17)	
UNEMPL(-10)	-0.423		-0.429	
	(-1.12)		(-1.09)	
EMPL(-9)		**-98.65**		**-101.52**
		(-1.89)**		**(-1.88)****
EMPL(-10)		-12.78		-7.43
		(-0.23)		(-0.13)
EMPL(-11)		-27.50		-34.90
		(-0.44)		(-0.54)
PCTEPS(-2)			**1.081**	**1.611**
			(0.50)	**(0.76)**
PCTEPS(-3)			-0.270	0.295
			(-0.13)	(0.14)
PCTEPS(-4)			-0.576	-0.168
			(-0.27)	(-0.08)
Durbin-Watson	1.89	1.89	1.89	1.89

***, ***, * indicate significance at 1%, 5%, and 10% level, respectively.