# What Drives the Return on Commercial Mortgage-backed Securities?

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*by*

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***Executive Summary***

Commercial Mortgage-backed Securities (CMBS) are securities collateralized by a pool of mortgages on commercial real estate. In the U.S., CMBS is one of the fastest growing asset classes with aggregate outstanding balance of $597 billion as of December 2005, accounting for 24% of the $2.53 trillion commercial mortgage market. In 2005 alone, $169 billion of CMBS were issued in the U.S., a size that is equivalent to 50 times the CMBS issuance in 1988 or 3 times the issuance in 2000. Despite the significance of CMBS as one of the fastest growing asset classes and the increasing interest in CMBS by institutional investors, available empirical evidence on the investment performance of CMBS is lacking. This study sheds light on the performance of CMBS as an asset class, the driving forces behind the CMBS return variability, and the relative importance of these variables in predicting CMBS returns.

The first part of the study examines the market characteristics, return and risk performance of commercial mortgage-backed securities as an investment class. Based on monthly data on Lehman Brothers investment-grade and high-yield CMBS indices from January 1997 to June 2006, 62% of the CMBS issues are investment-grade (rated BBB or higher), which accounts for 95% of the amount of CMBS outstanding. The mean return and total risk-adjusted return (i.e., Sharpe ratio) on investment-grade and high-yield CMBS clearly dominate those on investment-grade and high-yield corporate bonds, Treasuries, and stocks. Although CMBS outperform the residential MBS (RMBS) on a mean return basis, they underperform RMBS on a total risk-adjusted basis. The outstanding performance of CMBS and RMBS, however, should be interpreted with caution given the short history of available data and the relatively accommodating real estate environment during the sample period.

The second part of this study uses a structural vector autoregressive (VAR) model to examine what drives the return on CMBS and how. A list of potential drivers of CMBS returns are included as endogenous variables in the VAR model: growth rate in the industrial productions; inflation rate; change in the 30-year mortgage rate; change in term structure spread; change in investment-grade credit spread; change in high-yield credit spread; excess

return on the S&P 500 stock index; delinquency rate on CMBS; and change in the amount of CMBS issuance. Impulse response analysis and variance decomposition based on monthly data from May 2000 (inception of CMBS underwriting standardization) to June 2006 indicate a strong dynamic relationship between CMBS excess returns and these economic and financial variables.

Impulse response analysis indicates that the growth in industrial productions, inflation rate, change in 30-year mortgage rate, and change in term structure spread all have significant and negative contemporaneous effects on the excess returns on investment-grade and high-yield CMBS. Variance decomposition reveals that the change in mortgage rate and the term structure spread together explain 57% and 44% of the variance in investment-grade and high-yield CMBS excess returns, respectively. The required returns on CMBS are positively driven by the changes in credit spread, but this positive effect is much stronger for high-yield CMBS than for investment-grade CMBS. Delinquency rate of CMBS does not show have any additional significant impact beyond the effect of credit spread. The contemporaneous return on S&P 500 appears to have negative impacts on both investment-grade and high-yield CMBS excess returns, although the impact is stronger and more significant for investment-grade CMBS. Monthly change in the amount of CMBS issuance shows a significant negative lag effect on CMBS excess returns.

In addition to the structural VAR analysis using monthly data, I also examine quarterly data on the return performance on CMBS indices, commercial mortgage index and commercial property index, and find that CMBS performance is highly corrected with performance in non-traded commercial mortgages, but only has weak correlation with performance in commercial real estate property.

**What Drives the Return on Commercial Mortgage-backed Securities?**

## 1. Introduction

Commercial Mortgage-backed Securities (CMBS) are securities collateralized by a pool of mortgages on commercial real estate. In the U.S., CMBS is one of the fastest growing asset classes with aggregate outstanding balance of $597 billion as of December 2005, accounting for 24% of the $2.53 trillion commercial mortgage market. In 2005 alone, $169 billion of CMBS were issued in the U.S., a size that is equivalent to 50 times the CMBS issuance in 1988 or 3 times the issuance in 2000.

Similar to Residential Mortgage-backed Securities (RMBS), CMBS is the securitization product of mortgages. However, RMBS are mostly agency-guaranteed pass-throughs of cash flows from residential mortgages, while CMBS are mostly sequential-pay multiple tranches backed by cash flows from commercial mortgages. Contrary to RMBS, CMBS investors are concerned with default risk because the CMBS is backed by a less diversified pool of commercial mortgages that are not guaranteed and do not have any recourse to the borrower. On the other hand, while the dominating risk facing RMBS investors is prepayment risk, CMBS investors are largely protected from it by contractual provisions such as prepayment lockout, yield maintenance, defeasance and prepayment penalty.

Related research in the literature focuses primarily on the theoretical valuation [see Titman and Torome (1989), Kau et al. (1987, 1990), and Childs, Ott, and Riddiough (1996)], empirical pricing [see Maxam and Fisher (2001), and Harding, Sirmans, and Thebpanya (2004)], and default modeling [see Holmes (2003), and Chen and Deng (2004)] of commercial mortgages and CMBS. Others examine the determinants of commercial mortgage credit

spreads [Titman, Tompaidis, and Tsyplakov (2004)] or yield spreads on CMBS [Maris and Segal (2002)].

Despite the significance of CMBS as one of the fastest growing asset classes and the increasing interest in CMBS by institutional investors, available empirical evidence on the investment performance of CMBS has been limited to a small number of studies on the pricing & yields on individual CMBS issues [see Maxam and Fisher (2001), Maris and Segal (2002), and Harding, Sirmans, and Thebpanya (2004)] and some basic descriptive statistics on the yield, return and risk of CMBS [see Hess and Liang (2001), and Nomura Fixed Income Research (2005)]. There have been no studies examining the long-term return and risk characteristics of the CMBS as an asset class and its role in a broadly diversified investment portfolio (including stocks, Treasuries, corporate bonds, RMBS, among others).[1] On the other hand, although fundamental economic variables have been examined and are known for their impact on the returns on stocks, bonds and residential MBS [see Chen, Roll, and Ross (1986), Campbell and Ammer (1993), Elton, Gruber, and Blake (1995), and Xu and Fung (2005)], little is known for the type of economic variables relevant for CMBS returns.

## 2. Methodology

The first part of the study will provide a quantitative examination of the risk-return characteristics of CMBS and the role of CMBS in a broadly diversified investment portfolio. Average return (mean), risk (standard deviation), risk-adjusted return (Sharpe ratio) on Lehman Brothers investment-grade (IG) and high-yield (HY) CMBS indices will be estimated and compared with the risk-return distribution of RMBS and traditional asset classes such as

[1] Although the pricing and yield of CMBS have been researched in the literature, investors often find price return and yield to maturity to be unsatisfactory performance indicators on their CMBS investments.

stocks, Treasury bonds and corporate bonds during the same sample period. Correlation statistics will be computed to assess the degree of comovement between returns on CMBS, RMBS and traditional asset classes. This will advance the understanding of the risk and return performance of CMBS as a new and complex investment class, and allow professional money managers to make optimal decision on the strategic asset allocation of CMBS in a broadly diversified portfolio.

The second part of the study will investigate what economic factors drive the return of CMBS and how. According to the cash flow and risk characteristics of CMBS, I have identified the following real and financial economic variables as potential forces that move the return on CMBS: monthly growth rate in the seasonally-adjusted industrial productions; inflation rate (monthly percentage change in the seasonally adjusted CPI); monthly change in the 30-year mortgage rate; monthly change in the term structure spread (between 10-year Treasury yield and 3-month Treasury yield); monthly change in the investment-grade credit spread (yield spread between long-term AAA corporate bonds and long-term Treasury bonds), monthly change in the high-yield credit spread (yield spread between long-term BB corporate bonds and long-term Treasury bonds), excess return on the S&P 500 stock index, monthly delinquency rate on CMBS, and monthly change in the amount of CMBS issuance.

Although the use of contemporaneous regression to explain asset return is appealing given its simplicity, it has little to say about channels through which economic variables affect CMBS returns. In this study, I will use a structural vector autoregressive (VAR) model to examine economic factors that are important for the return on CMBS. Although the VAR model has been used in the finance literature [see, e.g., Hasbrouck (1991), Lee (1992), Campbell and Ammer (1993), and Xu and Fung (2005)], this approach has not been used for the CMBS research. In a reduced form of VAR, each endogenous variable in the system is

modeled as a function of the lagged values of all the endogenous variables in the system, and the error terms may be correlated with one another. In a structural form of VAR, restrictions are placed on the contemporaneous relations between the endogenous variables to allow for the identification of uncorrelated/independent structural shocks. One general approach to structural VAR identification is the Cholesky decomposition proposed by Sims (1980), which restricts the variable higher in the ordering to have no contemporaneous effect on the variables lower in the ordering. From the structural VAR model, I will be able to decompose the forecast variance of CMBS returns into components that can be explained by each of these variables. The structural VAR also enables me to investigate the extent to which an economic variable helps explain the CMBS returns and understand how returns of IG and NIG CMBS respond to shocks in these economic variables over time. The empirical results will help illuminate the dynamic relationships between the CMBS returns and these economic variables.

**3. Data**

As the investor base for CMBS broadened in the late 1990s, Lehman Brothers recognized the need for a formal CMBS index for use as a performance benchmark. The CMBS index was introduced by Lehman Brothers in January 1999, and back-dated to January 1997 [see Lehman Brothers (2002)]. Monthly data from January 1997 to June 2006 on the price return, coupon return, paydown return, weighted average maturity, duration and yield on the investment-grade and high-yield CMBS indices, corporate bond indices and other key fixed income indices were obtained from the Lehman Brothers Fixed Income Research Department.[2] Monthly data on CMBS issuance and delinquency rate were obtained from

[2]I will focus on total return instead of yield in this study to avoid the confounding problem of the reinvestment and prepayment. Total return, which is also called the holding period return, measures what investors can earn

Nomura Securities.[3] Monthly data on the 30-year mortgage rate, Treasury yields, CPI, and industrial productions were obtained from the Federal Reserve Board. Quarterly data on NCREIF commercial property performance index [see NCREIF (2005)] and Giliberto-Levy commercial mortgage performance index [see Giliberto (1997)] were also obtained to allow for comparison of the return performance on CMBS versus return on nontraded commercial mortgage or commercial property.[4]

For the first part of the study in examining the risk and return of CMBS as an asset class, I will present results on the whole sample period from January 1997 (the inception of Lehman CMBS index available data) to June 2006, and those on the standard CMBS sample period from May 2000 (inception of CMBS underwriting standardization) to June 2006. As for the second part of the study on structural VAR modeling of factors driving the CMBS excess return, I will focus on the standard CMBS sample period to ensure the availability of data for all relevant factors.

## 4. Empirical Results

### *4.1 Market Characteristics, Return and Risk of CMBS as an Asset Class*

Table 1 presents the descriptive statistics of the Lehman Brothers CMBS indices and other major fixed income indices at the end of the sample period. As of June 2006, there are 3,970 issues included in the Lehman Brothers investment-grade (IG) CMBS index with $435 billion outstanding, and 2,410 issues included in the Lehman Brothers high-yield (HY) CMBS

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from a security over a specified holding period, and it is the most commonly used measure of return for all securities (stocks, bonds, etc). Total return on CMBS is computed as the sum of price return, coupon return and prepayment return for each monthly period.

[3] Data for monthly delinquency rate on CMBS are only available from May 2000, when the CMBS underwriting became standardized.

[4] Only quarterly data are available for these two groups of indices. Monthly data are not available.

index with $25 billion outstanding. These represent more than 75% of the CMBS market. The IG and HY CMBS have option-adjusted spreads (OASs) of 0.737% and 6.595% above the Treasury, while the OASs for IG and HY corporate bonds are 0.944% and 3.204% respectively. The IG CMBS (rated BBB or higher) accounts for 94% of all CMBS in terms of outstanding amount and 62% in terms of number of issues (see Table 2 and Charts 1-2). AAA-rated CMBS, in particular, accounts for a much higher percentage in CMBS than that in corporate bonds, with 27% of CMBS rated AAA and only 1.9% of corporate bond rated AAA, in terms of number of issues. In terms of outstanding amount, AAA-rated CMBS account for 83%, while AAA-rated corporate bonds account for only 3.3%. On the other hand, the CMBS market is much smaller than the residential MBS market (about 14.5% of the size of the RMBS market) and the average size of a CMBS issue is about 1.4% of the average size of a RMBS issue ($110 million for CMBS vs. $7.566 billion for RMBS).

Table 3 presents the return and risk statistics on CMBS indices, corporate bond indices, and other major asset classes for the whole sample period (see Panel A) and the standard CMBS sample period (see Panel B). The mean return and Sharpe ratio of CMBS IG and HY indices both dominate those on corporate bond IG and HY indices, respectively. This holds true for the whole sample period and the standard CMBS sample. Both panels also show that although CMBS outperform RMBS and Asset-backed Securities (ABS) on a mean return basis, they underperform RMBS and Asset-backed Securities (ABS) on a total risk-adjusted basis (i.e. Sharpe ratio). In fact, among the major asset classes (stocks, Treasuries, Corporate bonds, RMBS, CMBS, and ABS), the three securitized asset classes (RMBS, CMBS, ABS) perform the best during the whole sample period and the standard sample period.

Since investors are mostly taking a portfolio approach in investing, the examination of CMBS should also be performed on a correlation basis. Table 4 presents the correlation of

total returns on CMBS and other major Lehman fixed income indices with total return on S&P 500 stock index (SI) and total return on Lehman U.S. aggregate bond Index (BI). IG CMBS have a correlation of over 0.966 and 0.975 with the BI, during the whole sample period and the standard sample period, respectively. This is slightly higher than the IG corporate bonds' correlation with the BI, and much higher than the HY CMBS' correlation with the BI. The HY CMBS' correlation with the BI, however, is still much higher than the HY corporate bonds' correlation with the BI, as HY corporate bonds have a positive and highly significant correlation with the SI. In general, CMBS and most fixed income classes have negative correlations with SI, and these negative correlations are much more significant during the standard CMBS sample period, during which the stock market had a major correction for the first three years. During the standard CMBS sample period, IG and HY CMBS have correlations of -0.351 and -0.342 with the SI, demonstrating a strong potential for risk diversification when combining stocks and CMBS in an investment portfolio.

*4.2 Drivers of Excess Return on CMBS*

I use a structural vector autoregressive (VAR) model to examine what factors drive the excess return on CMBS and how.[5] The excess return on investment-grade CMBS (ERICM) is analyzed in the context of seven other economic and financial endogenous variables, which are IPSAG (growth in industrial productions), INF (inflation rate), MR30D (change in 30-year mortgage rate), TSD (change in term structure spread), DYSAD (change in investment-grade credit spread), ERSP (excess return on S&P 500 stock index), and CMSID (change in the amount of CMBS issuance). To examine drivers of the excess return on high-yield CMBS (ERHCM), I include a similar list of economic and financial variables in the VAR model with

[5] Excess return is computed as the total return on CMBS less the three-month Treasury bill rate.

minor modification from the ERICM case: first, the DYSAD (change in investment-grade credit spread) variable is replaced by the DYSBD (change in high-yield credit spread); second, an additional endogenous variable, CMSD (delinquency rate on CMBS), is added to capture additional credit risk not captured by DTSBD. Table 5 reports the descriptive statistics of these economic and financial variables that are potential drivers of the CMBS return dynamics.[6] To ensure the availability of data on all endogenous variables, I use the standard CMBS sample period from May 2000 to June 2006 in the VAR modeling.

In a reduced form of the VAR, each endogenous variable in the system is modeled as a function of the lag values of all the endogenous variables in the system, and the error terms may be correlated with one another. In this structural form of the VAR, restrictions are placed on the contemporaneous relations among the endogenous variables to allow for identification of uncorrelated/independent structural shocks. Sims (1980) first introduced the impulse response analysis into VAR modeling as a descriptive device intended to represent the reaction of each variable to a shock (or innovation) in each equation of the VAR system over time. A meaningful impulse response analysis requires that shocks be uncorrelated. This orthogonal condition is fulfilled in this structural VAR framework.

Table 6 reports the impulse response of CMBS excess returns to shocks in IPSAG, INF, MR30D, TSD, DTSAD, DTSBD, ERSP, CMBSD, CMBSID. Panel A presents the results for investment-grade CMBS, while Panel B presets the results for the high-yield CMBS. Since the goal is to investigate how the economic and financial variables affect CMBS returns, I order the variables from the real sector to the financial sector.

[6] I conduct unit root tests to check if these economic variables are stationary. For variables that are stationary, I compute the first differencing of these variables to induce stationarity.

Shocks in two major economic variables, growth in industrial productions (IPSAG) and inflation rate (INF), both appear to have immediate negative effects on IG and HY CMBS excess returns. The effect, however, is stronger on HY CMBS than the effect on IG CMBS. The changes in 30-year mortgage rate (MG30D) and term structure spread (TSD) have highly significant and negative contemporaneous effects on ERICM and ERHCM. This result further demonstrates the importance of interest rate level and term structure on the debt securities in real estate. As interest rate level and term structure spread decreases, the discount rate effect tends to drive up the excess returns on CMBS. Unlike residential MBS, commercial MBS are largely protected from prepayment risk due to terms such as prepayment lockout, yield maintenance, defeasance, and prepayment penalties. As a result, the impacts of a higher mortgage rate and a higher yield curve spread on CMBS excess returns are highly significant and unambiguously negative.

The change in high-yield credit spread (DYSBD) has a highly significant and positive contemporaneous effect on HY CMBS excess return, implying that investors are requiring a higher return on HY CMBS with an increase in credit risk premium. Although the change in investment-grade credit spread (DYSAD) also has a positive effect on IG CMBS excess return, the effect is not significant. For HY CMBS, I also add the CMBS delinquency rate (CMBSD) variable to capture any additional impact of credit risk, but it does not appear to have any significant contemporaneous or lag effect on HY CMBS.

Inclusion of excess return on S&P 500 (ERSP) in the structural VAR model sheds light on how the stock market affects CMBS returns. The contemporaneous ERSP appears to have negative impacts on both IG and HY CMBS excess returns, although the impact is stronger and more significant for IG CMBS. This is not surprising given the substitution effect of stock

and bond investing in portfolio allocation and the strong negative correlation between stocks and CMBS during the sample period.

The monthly change in the amount of CMBS issuance (CMBSID) appears to have a negative and highly significant lag effect on the HY CMBS excess return, and a negative and marginally significant lag effect on the IG CMBS excess return. The negative lag impact of increase in CMBS issuance on CMBS excess returns is expected from a supply-demand perspective: an overwhelming increase in supply tends to depress the price and lead to a lower return as the securities gradually absorbed by the market. Finally, IG and HY CMBS excess returns are also strongly affected by their own shocks, as demonstrated by the highly significant and positive response to ERICM and ERHCM, respectively. The response of ERHCM to its own shock is persistent from three monthly periods, while the response of ERICM to its own shock is mainly contemporaneous.

While impulse response analysis is performed to illustrate how variables in the VAR system react over time to innovations or shocks in other variables, a variance decomposition technique allows us to compare the role that different variables play in causing such responses. Table 7 reports two panels of results showing variance decomposition of excess returns on the IG CMBS (Panel A) and HY CMBS (Panel B).

Several results are worth noting. First, shocks to excess return on CMBS consistently explain 30-35% of the variation of its own movement. Second, the change in mortgage rate (MG30D) and the term structure spread (TSD) together explain a sizable portion of the variation in CMBS excess returns (about 57% for IG CMBS and 44% for HY CMBS). This result implies that the change in mortgage rate and yield curve dynamics are the critical driving forces for the CMBS excess returns, especially IG CMBS. Third, the growth in industrial productions (IPSAG) and inflation (INF) explain 6.8% and 5.6% of HY CMBS

excess return, but only 3.9% and 1.3% of IG CMBS excess return. Fourth, the high-yield credit spread (DYSBD) explains 7.7% of the HY CMBS excess return, while the investment-grade credit spread (DYSAD) only explains 0.1% of IG CMBS excess return, demonstrating a greater sensitivity to credit risk premium in the high yield sector of CMBS market. Finally, the change in monthly issuance of CMBS explains a much greater percentage of variation in CMBS excess returns in future periods than that in the current period.

*4.3 Performance of CMBS, Commercial Mortgage and Commercial Property*

In the structural VAR model discussed in section 4.2, I do not include any factor on commercial property performance since only quarterly data are available for such performance index. In Table 8, I provide some basic descriptive statistics and a time series chart to illustrate the comparative performance of CMBS versus the performance on commercial property or commercial mortgage using quarterly data for the whole sample period and the standard CMBS sample period. The returns on investment-grade CMBS and the Giliberto-Levy commercial mortgage performance index have a correlation of 0.91 during the whole sample period and a 0.96 correlation during the standard CMBS sample period. This is expected given that CMBS are simply securitization product of commercial mortgages. High-yield CMBS have weaker correlation with the commercial mortgage performance index, but the correlation is still highly significant. The returns on CMBS, which are basically debt securities for commercial property, have negative and insignificant correlations with the return on NCREIF Commercial Property Index, suggesting that the CMBS market is more likely to be driven by the economic and financial factors as identified by the structural VAR model than the commercial real property market.

## 5. Conclusion

The first part of this study examines the market characteristics, return and risk performance of commercial mortgage-backed securities using monthly data on Lehman Brothers investment-grade and high-yield commercial mortgage-backed securities (CMBS) indices and other major Lehman fixed income indices from January 1997 to June 2006. 27% of the CMBS issues are AAA-rated, which accounts for 83% of the amount of CMBS outstanding. 62% of the CMBS issues are investment-grade (BBB or higher), which accounts for 95% of the amount of CMBS outstanding. The mean return and Sharpe ratio on investment-grade and high-yield CMBS clearly dominate those on investment-grade and high-yield corporate bonds, Treasuries, and stocks. Although CMBS outperform the residential MBS and Asset-backed Securities (ABS) on a mean return basis, it underperforms residential MBS on a total risk-adjusted basis. The outstanding performance of CMBS and RMBS, however, should be interpreted with caution given the short history of available data and the relatively accommodating real estate environment.

Using a structural vector autoregressive (VAR) model, the second part of this study examines what drives the return on CMBS and how. A list of potential drivers of CMBS returns are included as endogenous variables in the VAR model: growth rate in the industrial productions; inflation rate; change in the 30-year mortgage rate; change in term structure spread; change in investment-grade credit spread; change in high-yield credit spread; excess return on the S&P 500 stock index; delinquency rate on CMBS; and change in the amount of CMBS issuance. Impulse response analysis and variance decomposition based on the monthly data from May 2000 to June 2006 (standard CMBS sample period) indicate a strong dynamic relationship between CMBS excess returns and these economic and financial variables.

Impulse response analysis indicates that the growth in industrial productions, inflation rate, change in 30-year mortgage rate, and change in term structure spread all have significant and negative contemporaneous effects on the excess returns on investment-grade and high-yield CMBS. Variance decomposition reveals that the change in mortgage rate and the term structure spread together explain 57% and 44% of the variance in investment-grade and high-yield CMBS excess returns, respectively. The required returns on CMBS are positively driven by the changes in credit spread, but this positive effect is much stronger for high-yield CMBS than the effect for investment-grade CMBS. The contemporaneous return on S&P 500 appears to have negative impacts on both investment-grade and high-yield CMBS excess returns, although the impact is stronger and more significant for investment-grade CMBS. Monthly change in the amount of CMBS issuance shows a negative lag effect on CMBS excess returns.

Finally, using quarterly data on the return performance on CMBS indices, commercial mortgage index and commercial property index, this study finds that CMBS performance is highly corrected with performance in non-traded commercial mortgages, but only has weak correlation with performance in commercial property.

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**Table 1. Descriptive Statistics of Lehman Brothers CMBS Indices and Other Lehman Brothers Fixed Income Indices (as of June 2006)**

| | Coupon (%) | Duration | Yield to Worst (%) | Option-adjusted Spread | Amt Outstanding (MM) | Market Value (MM) | Number of Issues |
|---|---|---|---|---|---|---|---|
| U.S. Aggregate Bond Index | 5.290 | 4.796 | 5.788 | 0.477 | 8,358,009 | 8,312,471 | 6,837 |
| U.S. Universal Bond Index | 5.514 | 4.802 | 6.012 | 0.707 | 9,769,279 | 9,710,198 | 13,867 |
| Global Aggregate | 4.373 | 5.373 | 4.358 | 0.277 | 21,746,053 | 22,130,428 | 10,720 |
| U.S. Treasury Index | 4.919 | 4.925 | 5.178 | -0.005 | 2,019,099 | 2,080,819 | 130 |
| Asset-Backed Securities | 4.809 | 2.757 | 5.763 | 0.591 | 103,710 | 102,029 | 546 |
| Residential MBS | 5.360 | 4.560 | 6.107 | 0.569 | 3,003,632 | 2,904,383 | 397 |
| CMBS Investment Grade (IG) | 5.444 | 4.661 | 5.879 | 0.737 | 435,380 | 424,371 | 3,970 |
| *CMBS AAA* | 5.381 | 4.565 | 5.843 | 0.702 | 383,446 | 373,573 | 1,722 |
| *CMBS AA* | 5.845 | 5.180 | 5.968 | 0.822 | 18,036 | 17,723 | 644 |
| *CMBS A* | 5.946 | 5.229 | 6.052 | 0.909 | 16,723 | 16,462 | 708 |
| *CMBS BBB* | 5.938 | 5.686 | 6.421 | 1.270 | 17,175 | 16,613 | 896 |
| CMBS High Yield (HY) | 5.716 | 5.228 | 11.759 | 6.595 | 25,469 | 16,334 | 2,410 |
| *CMBS BB* | 5.776 | 5.384 | 7.739 | 2.596 | 10,890 | 9,610 | 946 |
| *CMBS B* | 5.734 | 5.309 | 13.238 | 8.068 | 6,681 | 4,279 | 928 |
| *CMBS High Yield Other* | 5.619 | 4.468 | 24.974 | 19.735 | 7,898 | 2,445 | 536 |
| Corporate Investment Grade (IG) | 5.937 | 5.840 | 6.143 | 0.944 | 1,584,009 | 1,596,240 | 2,697 |
| *Corporate AAA* | 5.110 | 5.092 | 5.787 | 0.611 | 72,356 | 72,176 | 80 |
| *Corporate AA* | 5.325 | 4.769 | 5.853 | 0.677 | 325,040 | 323,449 | 372 |
| *Corporate A* | 5.900 | 6.002 | 6.084 | 0.874 | 635,469 | 640,205 | 1,132 |
| *Corporate BBB* | 6.450 | 6.370 | 6.424 | 1.221 | 551,143 | 560,410 | 1,113 |
| Corporate High Yield (HY) | 7.888 | 4.606 | 8.575 | 3.204 | 603,005 | 589,323 | 1,598 |
| *Corporate BB* | 7.282 | 4.846 | 7.859 | 2.552 | 253,676 | 248,400 | 552 |
| *Corporate B* | 8.196 | 4.518 | 8.385 | 2.994 | 258,960 | 257,927 | 746 |
| *Corporate CCC* | 8.717 | 4.216 | 10.848 | 5.343 | 79,667 | 74,870 | 263 |
| *Corporate CC to D* | 9.321 | 3.494 | 19.188 | 12.980 | 5,752 | 4,187 | 22 |

**Table 2. CMBS and Corporate Bonds by Various Credit Ratings**

| | By Amount Outstanding | | By No. of Issues | |
|---|---|---|---|---|
| | CMBS | Corporate | CMBS | Corporate |
| AAA | 83.20% | 3.32% | 26.99% | 1.87% |
| AA | 3.91% | 14.90% | 10.09% | 8.69% |
| A | 3.63% | 29.12% | 11.10% | 26.45% |
| BBB | 3.73% | 25.26% | 14.04% | 26.00% |
| BB | 2.36% | 11.63% | 14.83% | 12.90% |
| B | 1.45% | 11.87% | 14.55% | 17.43% |
| High Yield - Other | 1.71% | 3.91% | 8.40% | 6.66% |
| | | | | |
| Investment-Grade Total | 94.47% | 72.59% | 62.23% | 63.01% |
| High-Yield Total | 5.53% | 27.41% | 37.77% | 36.99% |

**Chart 1. Distribution of CMBS and Corporate Bonds by Amount Outstanding**

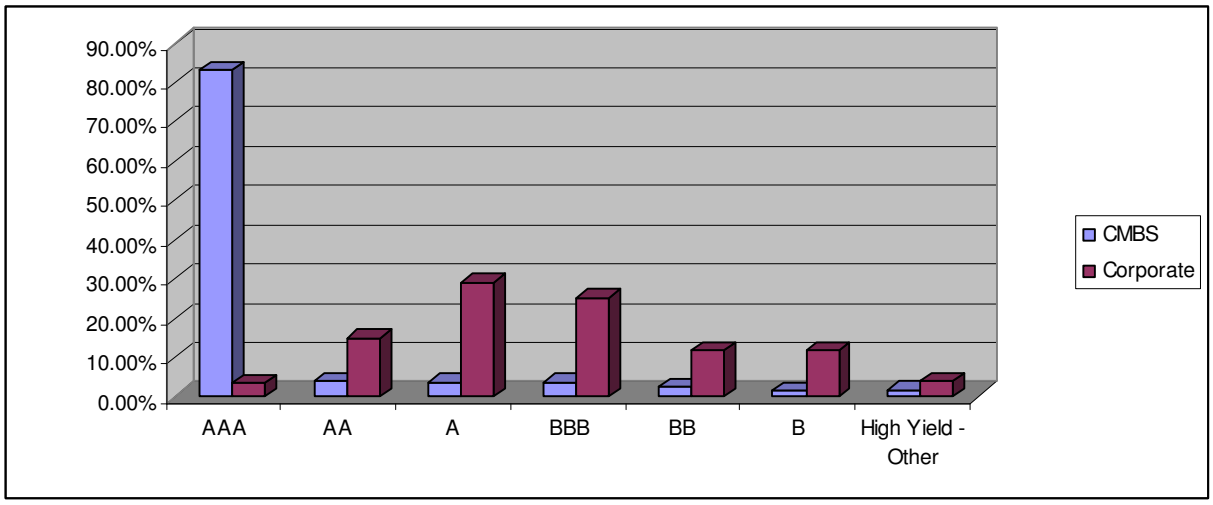



**Chart 2. Distribution of CMBS and Corporate Bonds by Number of Issues**

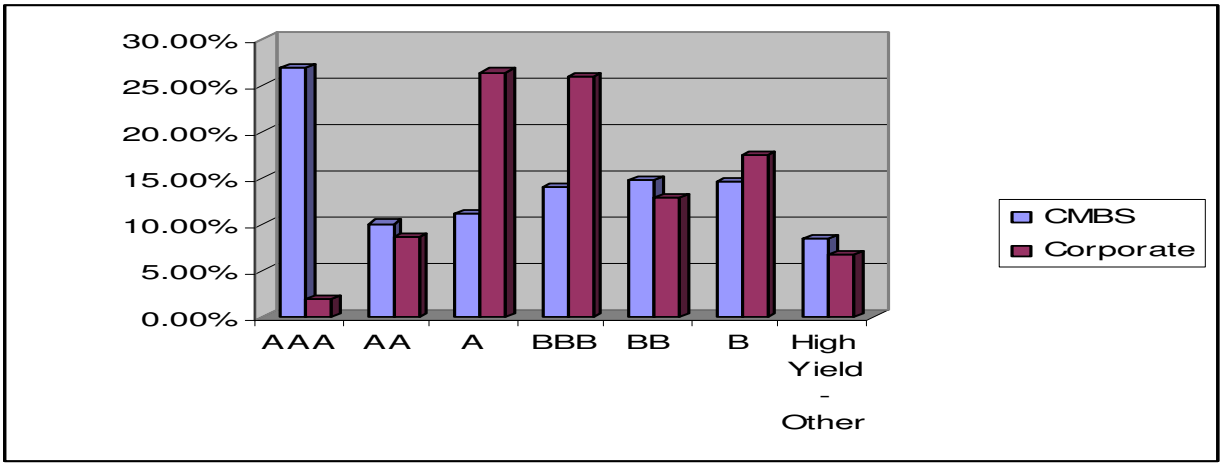


**Table 3. Comparison of Return and Risk Measures of CMBS Indices and Indices on Other Asset Classes**

Panel A. Whole sample period: January 1997 to June 2006

| | Mean Total Return | Median Total Return | Mean Excess Return | Median Excess Return | Std Dev of Excess Return | Sharpe Ratio |
|---|---|---|---|---|---|---|
| S&P 500 | 0.709 | 0.925 | 0.411 | 0.708 | 4.532 | 0.091 |
| U.S. Aggregate Bond Index | 0.494 | 0.585 | 0.196 | 0.240 | 1.039 | 0.189 |
| U.S. Universal Bond Index | 0.504 | 0.582 | 0.206 | 0.258 | 1.006 | 0.205 |
| Global Aggregate | 0.448 | 0.289 | 0.150 | 0.032 | 1.597 | 0.094 |
| U.S. Treasury Index | 0.480 | 0.503 | 0.182 | 0.224 | 1.324 | 0.138 |
| Asset-Backed Securities | 0.477 | 0.470 | 0.179 | 0.122 | 0.755 | 0.237 |
| Residential MBS | 0.483 | 0.570 | 0.185 | 0.198 | 0.747 | 0.248 |
| CMBS Investment Grade (IG) | 0.574 | 0.573 | 0.276 | 0.252 | 1.396 | 0.198 |
| *CMBS AAA* | 0.563 | 0.547 | 0.265 | 0.270 | 1.360 | 0.195 |
| *CMBS AA* | 0.606 | 0.677 | 0.309 | 0.260 | 1.561 | 0.198 |
| *CMBS A* | 0.614 | 0.612 | 0.316 | 0.319 | 1.554 | 0.203 |
| *CMBS BBB* | 0.670 | 0.683 | 0.372 | 0.418 | 1.743 | 0.213 |
| CMBS High Yield (HY) | 0.978 | 1.103 | 0.680 | 0.759 | 2.940 | 0.231 |
| *CMBS BB* | 0.904 | 0.902 | 0.607 | 0.600 | 2.882 | 0.210 |
| *CMBS B* | 0.963 | 1.099 | 0.665 | 0.816 | 2.851 | 0.233 |
| *CMBS High Yield Other* | 1.555 | 1.684 | 1.257 | 1.341 | 5.265 | 0.239 |
| Corporate Investment Grade (IG) | 0.514 | 0.615 | 0.216 | 0.325 | 1.358 | 0.159 |
| *Corporate AAA* | 0.521 | 0.619 | 0.223 | 0.291 | 1.370 | 0.163 |
| *Corporate AA* | 0.528 | 0.641 | 0.230 | 0.270 | 1.243 | 0.185 |
| *Corporate A* | 0.508 | 0.679 | 0.210 | 0.328 | 1.341 | 0.157 |
| *Corporate BBB* | 0.505 | 0.607 | 0.207 | 0.316 | 1.512 | 0.137 |
| Corporate High Yield (HY) | 0.513 | 0.730 | 0.215 | 0.472 | 2.190 | 0.098 |
| *Corporate BB* | 0.586 | 0.769 | 0.288 | 0.492 | 1.709 | 0.168 |
| *Corporate B* | 0.466 | 0.752 | 0.168 | 0.485 | 2.396 | 0.070 |
| *Corporate CCC* | 0.460 | 0.753 | 0.162 | 0.360 | 3.868 | 0.042 |
| *Corporate CC to D* | 0.828 | 0.610 | 0.530 | 0.296 | 5.748 | 0.092 |

Panel B. Standard CMBS sample period: May 2000 to June 2006

| | Mean Total Return | Median Total Return | Mean Excess Return | Median Excess Return | Std Dev of Excess Return | Sharpe Ratio |
|---|---|---|---|---|---|---|
| S&P 500 | 0.040 | 0.575 | -0.192 | 0.318 | 4.176 | -0.046 |
| U.S. Aggregate Bond Index | 0.506 | 0.662 | 0.274 | 0.442 | 1.096 | 0.250 |
| U.S. Universal Bond Index | 0.526 | 0.699 | 0.294 | 0.425 | 1.063 | 0.276 |
| Global Aggregate | 0.565 | 0.472 | 0.333 | 0.242 | 1.657 | 0.201 |
| U.S. Treasury Index | 0.472 | 0.603 | 0.240 | 0.393 | 1.437 | 0.167 |
| Asset-Backed Securities | 0.490 | 0.500 | 0.258 | 0.264 | 0.803 | 0.322 |
| Residential MBS | 0.485 | 0.603 | 0.253 | 0.328 | 0.776 | 0.326 |
| CMBS Investment Grade (IG) | 0.623 | 0.770 | 0.392 | 0.389 | 1.442 | 0.272 |
| *CMBS AAA* | 0.606 | 0.753 | 0.374 | 0.376 | 1.408 | 0.266 |
| *CMBS AA* | 0.671 | 0.762 | 0.439 | 0.449 | 1.609 | 0.273 |
| *CMBS A* | 0.692 | 0.777 | 0.460 | 0.425 | 1.624 | 0.283 |
| *CMBS BBB* | 0.771 | 0.846 | 0.539 | 0.614 | 1.645 | 0.328 |
| CMBS High Yield (HY) | 1.140 | 1.135 | 0.908 | 0.825 | 1.889 | 0.481 |
| *CMBS BB* | 1.105 | 0.978 | 0.873 | 0.677 | 2.067 | 0.422 |
| *CMBS B* | 1.098 | 1.099 | 0.866 | 0.816 | 1.792 | 0.483 |
| *CMBS High Yield Other* | 1.453 | 1.684 | 1.221 | 1.341 | 1.743 | 0.700 |
| Corporate Investment Grade (IG) | 0.564 | 0.728 | 0.332 | 0.495 | 1.427 | 0.233 |
| *Corporate AAA* | 0.558 | 0.688 | 0.326 | 0.427 | 1.381 | 0.236 |
| *Corporate AA* | 0.567 | 0.676 | 0.335 | 0.387 | 1.291 | 0.260 |
| *Corporate A* | 0.552 | 0.756 | 0.320 | 0.561 | 1.400 | 0.229 |
| *Corporate BBB* | 0.563 | 0.797 | 0.331 | 0.549 | 1.616 | 0.205 |
| Corporate High Yield (HY) | 0.594 | 1.091 | 0.362 | 0.904 | 2.455 | 0.148 |
| *Corporate BB* | 0.654 | 1.028 | 0.422 | 0.809 | 1.923 | 0.219 |
| *Corporate B* | 0.534 | 0.892 | 0.302 | 0.629 | 2.678 | 0.113 |
| *Corporate CCC* | 0.537 | 1.099 | 0.305 | 0.746 | 4.308 | 0.071 |
| *Corporate CC to D* | 1.403 | 1.467 | 1.171 | 1.280 | 6.492 | 0.180 |

Note: All returns are in %.

**Table 4. Correlation of Total Returns on CMBS and Other Major Lehman Brothers Fixed Income Indices with Total Return on S&P 500 Stock Index and Total Return on Lehman Brothers U.S. Aggregate Bond Index**

| | Correlation with Total Return on S&P 500 Index | | Correlation with Total Return on Lehman Brothers U.S. Aggregate Bond Index | |
|---|---|---|---|---|
| | Whole Sample Period Jan 1997-June 2006 | Standard Sample Period May 2000-June 2006 | Whole Sample Period Jan 1997-June 2006 | Standard Sample Period May 2000-June 2006 |
| U.S. Aggregate Bond Index | -0.112 | **-0.302** | **1.000** | **1.000** |
| U.S. Universal Bond Index | 0.016 | ***-0.214*** | **0.977** | **0.990** |
| Global Aggregate | -0.055 | -0.147 | **0.674** | **0.681** |
| U.S. Treasury Index | **-0.227** | **-0.416** | **0.968** | **0.972** |
| Asset-Backed Securities | **-0.229** | **-0.422** | **0.946** | **0.944** |
| Residential MBS | -0.075 | **-0.286** | **0.925** | **0.932** |
| CMBS Investment Grade (IG) | -0.138 | **-0.351** | **0.962** | **0.976** |
| *CMBS AAA* | -0.134 | **-0.350** | **0.966** | **0.975** |
| *CMBS AA* | -0.137 | **-0.345** | **0.955** | **0.975** |
| *CMBS A* | -0.144 | **-0.343** | **0.946** | **0.970** |
| *CMBS BBB* | ***-0.163*** | **-0.347** | **0.834** | **0.939** |
| CMBS High Yield (HY) | -0.125 | **-0.342** | **0.554** | **0.847** |
| *CMBS BB* | -0.125 | **-0.361** | **0.598** | **0.847** |
| *CMBS B* | -0.107 | ***-0.223*** | **0.514** | **0.786** |
| *CMBS High Yield Other* | -0.097 | **-0.309** | **0.261** | **0.635** |
| Corporate Investment Grade (IG) | 0.051 | -0.109 | **0.933** | **0.930** |
| *Corporate AAA* | -0.062 | **-0.267** | **0.978** | **0.984** |
| *Corporate AA* | -0.060 | **-0.277** | **0.975** | **0.980** |
| *Corporate A* | 0.009 | -0.164 | **0.943** | **0.942** |
| *Corporate BBB* | 0.126 | 0.021 | **0.854** | **0.838** |
| Corporate High Yield (HY) | **0.492** | **0.536** | 0.112 | 0.082 |
| *Corporate BB* | **0.464** | **0.482** | **0.270** | 0.194 |
| *Corporate B* | **0.481** | **0.525** | 0.083 | 0.071 |
| *Corporate CCC* | **0.383** | **0.450** | -0.079 | -0.070 |
| *Corporate CC to D* | **0.226** | **0.286** | -0.050 | 0.007 |

**Bold** -- Significant at 5%; ***Bold and Italic*** -- Significant at 10%.

## Table 5. Descriptive Statistics on All Endogenous Variables in the VAR System

ERICM is the excess return on investment-grade CMBS index, ERHCM is the excess return on high-yield CMBS index, IPSAG is the monthly growth rate in the seasonally-adjusted industrial productions, INF is the inflation rate (monthly percentage change in the seasonally adjusted CPI), MR30D is the monthly change in the 30-year mortgage rate, TSD is the monthly change in term structure spread (between 10-year Treasury yield and 3-month Treasury yield), DYSAD is the monthly change in investment-grade credit spread (the yield spread between long-term AAA corporate bonds and long-term Treasury bonds), DYSBD is the monthly change in high-yield credit spread (the yield spread between long-term BB corporate bonds and long-term Treasury bonds), ERSP is the excess return on the S&P 500 stock index, CMSD is the monthly delinquency rate on CMBS, and CMSID is the monthly change in the amount of CMBS issuance. The results are based on monthly data from May 2000 to June 2006.

| | Mean | Median | Maximum | Minimum | Std. Dev. | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|
| ERICM | 0.392 | 0.389 | 3.363 | -4.540 | 1.442 | -0.541 | 3.901 |
| ERHCM | 0.908 | 0.825 | 5.709 | -4.865 | 1.889 | 0.062 | 3.750 |
| IPSAG | 0.114 | 0.073 | 1.126 | -1.334 | 0.519 | -0.145 | 2.545 |
| INF | 0.227 | 0.217 | 1.208 | -0.657 | 0.275 | 0.055 | 5.083 |
| MR30D | -0.020 | -0.055 | 0.630 | -0.370 | 0.193 | 1.074 | 4.227 |
| TSD | 0.000 | -0.060 | 0.820 | -0.420 | 0.280 | 0.926 | 3.261 |
| DYSAD | -0.019 | -0.002 | 0.265 | -0.908 | 0.144 | -3.372 | 21.394 |
| DYSBD | -0.028 | -0.012 | 1.619 | -1.282 | 0.471 | 0.436 | 4.770 |
| ERSP | -0.192 | 0.318 | 8.666 | -11.008 | 4.176 | -0.336 | 3.106 |
| CMBSD | 1.076 | 1.145 | 1.680 | 0.500 | 0.381 | -0.067 | 1.572 |
| CMBSID | 0.331 | 0.950 | 17.000 | -23.000 | 7.188 | -0.338 | 4.498 |

## Table 6. Impulse Response of CMBS Excess Return to One S.D. Innovations in Variables

IPSAG is the monthly growth rate in the seasonally-adjusted industrial productions, INF is the inflation rate (monthly percentage change in the seasonally adjusted CPI), MR30D is the monthly change in the 30-year mortgage rate, TSD is the monthly change in term structure spread (between 10-year Treasury yield and 3-month Treasury yield), DYSAD is the monthly change in investment-grade credit spread (the yield spread between long-term AAA corporate bonds and long-term Treasury bonds), DYSBD is the monthly change in high-yield credit spread (the yield spread between long-term BB corporate bonds and long-term Treasury bonds), ERSP is the excess return on the S&P 500 stock index, CMSD is the monthly delinquency rate on CMBS, CMSID is the monthly change in the amount of CMBS issuance, ERICM is the excess return on investment-grade CMBS index, and ERHCM is the excess return on high-yield CMBS index. The results are based on monthly data from May 2000 to June 2006.

Panel A. Impulse Response for Investment-grade CMBS Excess Return

| Period | IPSAG | INF | MR30D | TSD | DYSAD | ERSP | CMBSID | ERICM |
|---|---|---|---|---|---|---|---|---|
| 0 | ***-0.261*** | -0.152 | **-0.983** | **-0.188** | 0.046 | **-0.199** | -0.084 | **0.782** |
| | ***(-1.85)*** | (-1.09) | **(-8.40)** | **(-2.12)** | (0.53) | **(-2.31)** | (-1.00) | **(13.12)** |
| 1 | -0.078 | -0.122 | 0.030 | -0.008 | -0.063 | -0.218 | ***-0.222*** | 0.132 |
| | (-0.57) | (-0.86) | (0.25) | (-0.07) | (-0.45) | (-1.60) | ***(-1.87)*** | (1.22) |
| 2 | 0.032 | -0.008 | 0.107 | 0.138 | 0.117 | -0.060 | 0.088 | -0.097 |
| | (0.48) | (-0.10) | *(1.16)* | (1.80) | (1.94) | (-1.08) | (1.28) | *(-1.30)* |
| 3 | -0.063 | -0.007 | -0.033 | 0.042 | -0.006 | 0.042 | -0.028 | 0.012 |
| | (-1.48) | (-0.18) | (-0.73) | (1.04) | (-0.17) | (1.08) | (-0.65) | (0.29) |
| 4 | -0.018 | -0.020 | -0.032 | 0.019 | -0.012 | -0.026 | 0.017 | 0.035 |
| | (-0.69) | (-0.95) | (-1.16) | (0.67) | (-0.58) | (-1.20) | (0.66) | (1.27) |
| 5 | -0.018 | -0.014 | 0.000 | 0.018 | 0.008 | -0.011 | -0.022 | 0.003 |
| | (-0.96) | (-1.01) | (0.01) | (0.80) | (0.82) | (-0.71) | (-1.15) | (0.23) |
| 6 | -0.006 | -0.006 | -0.005 | 0.016 | 0.004 | -0.007 | 0.012 | 0.005 |
| | (-0.46) | (-0.59) | (-0.50) | (1.01) | (0.59) | (-0.80) | (0.89) | (0.54) |
| 7 | -0.010 | -0.005 | -0.004 | 0.008 | 0.001 | -0.002 | -0.009 | 0.004 |
| | (-1.06) | (-0.77) | (-0.66) | (0.68) | (0.14) | (-0.25) | (-0.88) | (0.65) |
| 8 | -0.003 | -0.004 | -0.003 | 0.007 | 0.001 | -0.005 | 0.004 | 0.004 |
| | (-0.45) | (-0.67) | (-0.81) | (0.78) | (0.41) | (-1.00) | (0.61) | (0.90) |
| 9 | -0.004 | -0.003 | -0.001 | 0.004 | 0.001 | -0.001 | -0.004 | 0.001 |
| | (-0.85) | (-0.70) | (-0.43) | (0.62) | (0.52) | (-0.36) | (-0.77) | (0.47) |
| 10 | -0.002 | -0.002 | -0.001 | 0.003 | 0.001 | -0.002 | 0.002 | 0.002 |
| | (-0.43) | (-0.57) | (-0.71) | (0.69) | (0.44) | (-0.79) | (0.54) | (0.75) |

Panel B. Impulse Response for High-Yield CMBS Excess Return

| Period | IPSAG | INF | MR30D | TSD | DYSBD | ERSP | CMBSD | CMBSID | ERHCM |
|---|---|---|---|---|---|---|---|---|---|
| 0 | **-0.453** | **-0.412** | **-0.913** | **-0.716** | **0.482** | ***-0.193*** | 0.093 | 0.060 | **1.009** |
| | **(-2.27)** | **(-2.13)** | **(-5.23)** | **(-4.91)** | **(3.78)** | ***(-1.65)*** | (0.78) | (0.50) | **(12.08)** |
| 1 | 0.050 | 0.102 | 0.065 | -0.083 | 0.227 | -0.088 | 0.001 | **-0.430** | 0.279 |
| | (0.25) | (0.49) | (0.38) | (-0.48) | (1.17) | (-0.46) | *(0.02)* | **(-2.51)** | (1.64) |
| 2 | 0.155 | 0.117 | ***0.227*** | 0.093 | -0.042 | -0.075 | 0.013 | ***0.184*** | ***-0.174*** |
| | (1.47) | (0.99) | ***(1.93)*** | (0.75) | (-0.45) | (-0.73) | (0.31) | ***(1.67)*** | ***(-1.68)*** |
| 3 | -0.053 | 0.012 | 0.003 | 0.017 | -0.082 | 0.055 | 0.005 | -0.041 | -0.061 |
| | (-0.80) | (0.20) | (0.05) | (0.24) | (-1.19) | (0.84) | (0.18) | (-0.64) | (-0.80) |
| 4 | 0.009 | -0.011 | -0.029 | 0.005 | 0.005 | 0.008 | 0.016 | 0.054 | 0.015 |
| | (0.26) | (-0.30) | (-0.65) | (0.14) | (0.15) | (0.22) | (0.66) | (1.30) | (0.38) |
| 5 | -0.017 | -0.016 | -0.007 | -0.006 | 0.009 | 0.007 | 0.010 | -0.042 | 0.011 |
| | (-0.74) | (-0.78) | (-0.36) | (-0.19) | (0.43) | (0.35) | (0.40) | (-1.40) | (0.54) |
| 6 | 0.010 | -0.001 | 0.005 | 0.011 | 0.001 | -0.009 | 0.013 | 0.019 | -0.002 |
| | (0.55) | (-0.03) | (0.41) | (0.38) | (0.10) | (-0.74) | (0.54) | (0.91) | (-0.14) |
| 7 | -0.010 | -0.006 | -0.001 | 0.009 | -0.002 | 0.005 | 0.011 | -0.011 | -0.001 |
| | (-0.67) | (-0.39) | (-0.08) | (0.35) | (-0.27) | (0.66) | (0.46) | (-0.77) | (-0.16) |
| 8 | -0.001 | -0.005 | -0.002 | 0.011 | 0.001 | -0.002 | 0.012 | 0.007 | 0.001 |
| | (-0.09) | (-0.37) | (-0.28) | (0.45) | (0.20) | (-0.33) | (0.52) | (0.67) | (0.16) |
| 9 | -0.008 | -0.007 | -0.003 | 0.010 | 0.001 | 0.001 | 0.011 | -0.005 | 0.002 |
| | (-0.58) | (-0.51) | (-0.41) | (0.41) | (0.24) | (0.22) | (0.49) | (-0.75) | (0.36) |
| 10 | -0.004 | -0.006 | -0.002 | 0.012 | 0.002 | -0.002 | 0.011 | 0.002 | 0.002 |
| | (-0.31) | (-0.44) | (-0.33) | (0.48) | (0.36) | (-0.41) | (0.51) | (0.35) | (0.35) |

Note: t-ratios are in parentheses.

**Bold** -- Significant at 5%; ***Bold and Italic*** -- Significant at 10%

## Table 7. Variance Decomposition of CMBS Excess Return

IPSAG is the monthly growth rate in the seasonally-adjusted industrial productions, INF is the inflation rate (monthly percentage change in the seasonally adjusted CPI), MR30D is the monthly change in the 30-year mortgage rate, TSD is the monthly change in term structure spread (between 10-year Treasury yield and 3-month Treasury yield), DYSAD is the monthly change in investment-grade credit spread (the yield spread between long-term AAA corporate bonds and long-term Treasury bonds), DYSBD is the monthly change in high-yield credit spread (the yield spread between long-term BB corporate bonds and long-term Treasury bonds), ERSP is the excess return on the S&P 500 stock index, CMSD is the monthly delinquency rate on CMBS, CMSID is the monthly change in the amount of CMBS issuance, ERICM is the excess return on investment-grade CMBS index, and ERHCM is the excess return on high-yield CMBS index. The results are based on monthly data from May 2000 to June 2006.

Panel A. Variance Decomposition for Investment-Grade CMBS Excess Return

| Period | IPSAG | INF | MR30D | TSD | DYSAD | ERSP | CMBSID | ERICM |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| 0 | 3.886 | 1.319 | 55.111 | 2.022 | 0.121 | 2.263 | 0.404 | 34.874 |
| 1 | 3.918 | 2.004 | 51.078 | 1.875 | 0.319 | 4.614 | 2.985 | 33.206 |
| 2 | 3.837 | 1.940 | 49.935 | 2.786 | 1.010 | 4.640 | 3.283 | 32.569 |
| 3 | 4.023 | 1.932 | 49.746 | 2.861 | 1.007 | 4.707 | 3.306 | 32.418 |
| 4 | 4.030 | 1.948 | 49.685 | 2.873 | 1.012 | 4.732 | 3.314 | 32.407 |
| 5 | 4.042 | 1.956 | 49.647 | 2.887 | 1.015 | 4.734 | 3.336 | 32.383 |
| 6 | 4.043 | 1.957 | 49.633 | 2.900 | 1.015 | 4.736 | 3.342 | 32.374 |
| 7 | 4.048 | 1.959 | 49.626 | 2.902 | 1.015 | 4.735 | 3.345 | 32.370 |
| 8 | 4.048 | 1.959 | 49.623 | 2.904 | 1.015 | 4.736 | 3.346 | 32.368 |
| 9 | 4.049 | 1.959 | 49.622 | 2.905 | 1.015 | 4.736 | 3.346 | 32.368 |
| 10 | 4.049 | 1.959 | 49.621 | 2.906 | 1.015 | 4.736 | 3.346 | 32.367 |

Panel B. Variance Decomposition for High-Yield CMBS Excess Return

| Period | IPSAG | INF | MR30D | TSD | DYSBD | ERSP | CMBSD | CMBSID | ERHCM |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| 0 | 6.800 | 5.624 | 27.603 | 16.978 | 7.675 | 1.227 | 0.286 | 0.118 | 33.689 |
| 1 | 6.176 | 5.358 | 24.897 | 15.439 | 8.422 | 1.330 | 0.257 | 5.585 | 32.538 |
| 2 | 6.555 | 5.490 | 25.160 | 14.945 | 8.069 | 1.423 | 0.250 | 6.270 | 31.838 |
| 3 | 6.598 | 5.466 | 25.030 | 14.877 | 8.214 | 1.501 | 0.249 | 6.285 | 31.779 |
| 4 | 6.592 | 5.462 | 25.021 | 14.858 | 8.205 | 1.501 | 0.256 | 6.359 | 31.745 |
| 5 | 6.596 | 5.465 | 25.004 | 14.848 | 8.201 | 1.501 | 0.259 | 6.402 | 31.724 |
| 6 | 6.597 | 5.464 | 24.998 | 14.848 | 8.199 | 1.504 | 0.263 | 6.411 | 31.716 |
| 7 | 6.599 | 5.464 | 24.995 | 14.848 | 8.198 | 1.504 | 0.267 | 6.414 | 31.712 |
| 8 | 6.599 | 5.464 | 24.992 | 14.850 | 8.197 | 1.504 | 0.271 | 6.414 | 31.709 |
| 9 | 6.600 | 5.465 | 24.990 | 14.852 | 8.196 | 1.504 | 0.274 | 6.414 | 31.706 |
| 10 | 6.599 | 5.465 | 24.988 | 14.854 | 8.195 | 1.504 | 0.278 | 6.414 | 31.703 |

**Table 8. Comparison among Returns on NCREIF Commercial Property Index, Giliberto-Levy Commercial Mortgage Index, Lehman Brother Investment-Grade CMBS Index, and Lehman Brother High-Yield CMBS Index**

The following statistics are based on quarterly data.

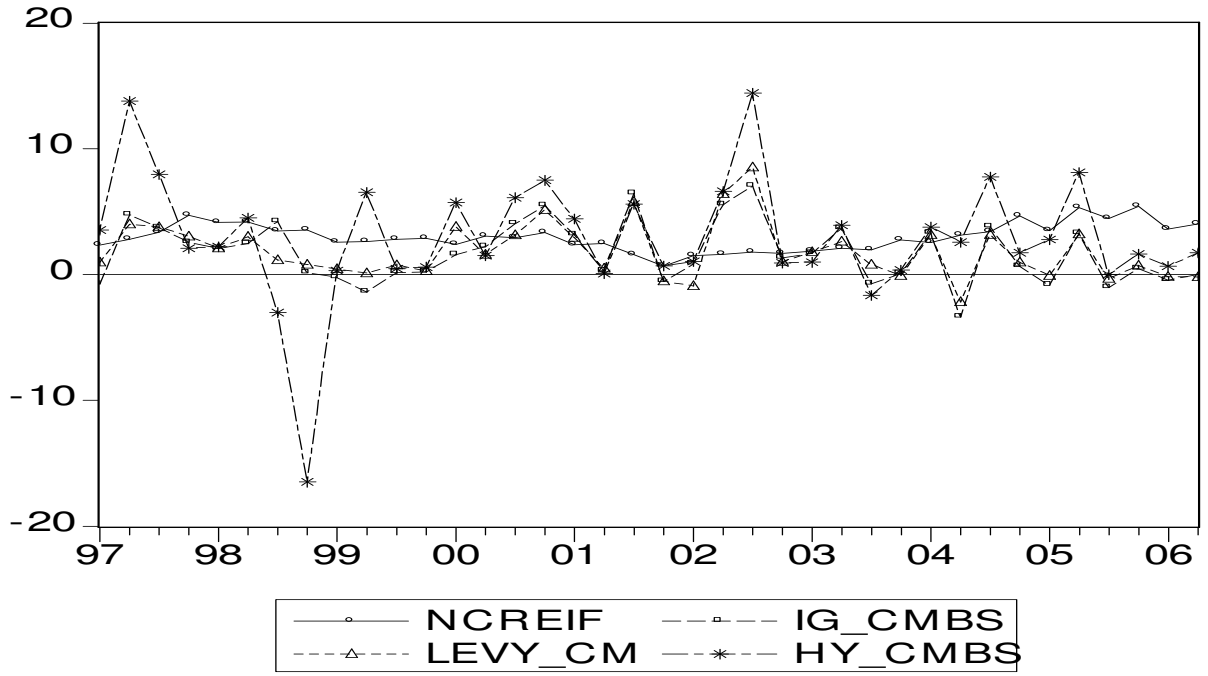
Panel A. Descriptive Statistics

| | NCREIF (NCREIF Commercial Property Index Return in %) | LEVY_CM (Giliberto-Levy Commercial Mortgage Index Return in %) | IG_CMBS (Lehman Brother Investment-Grade CMBS Return) | HY_CMBS (Lehman Brother High-Yield CMBS Return) |
|---|---|---|---|---|
| *Whole sample period from Q1 1997 to Q2 2006* | | | | |
| Mean | 2.993 | 1.875 | 1.731 | 2.941 |
| Median | 2.855 | 1.090 | 1.461 | 2.159 |
| Maximum | 5.430 | 8.540 | 7.032 | 14.413 |
| Minimum | 0.670 | -2.180 | -3.369 | -16.477 |
| Std. Dev. | 1.097 | 2.221 | 2.411 | 4.956 |
| Skewness | 0.328 | 0.884 | 0.320 | -0.980 |
| Kurtosis | 2.725 | 3.761 | 2.438 | 8.205 |
| *Standard CMBS sample period from Q2 2000 to Q2 2006* | | | | |
| Mean | 2.873 | 1.882 | 1.853 | 3.336 |
| Median | 2.760 | 1.030 | 1.334 | 1.747 |
| Maximum | 5.430 | 8.540 | 7.032 | 14.413 |
| Minimum | 0.670 | -2.180 | -3.369 | -1.648 |
| Std. Dev. | 1.236 | 2.554 | 2.638 | 3.572 |
| Skewness | 0.473 | 0.869 | 0.269 | 1.287 |
| Kurtosis | 2.535 | 3.280 | 2.325 | 4.696 |

Panel B. Correlation Matrix

| | NCREIF | LEVY_CM | IG_CMBS | HY_CMBS |
|---|---|---|---|---|
| *Whole sample period from Q1 1997 to Q2 2006* | | | | |
| NCREIF | 1.00 | | | |
| LEVY_CM | -0.13 | 1.00 | | |
| IG_CMBS | -0.12 | 0.91 | 1.00 | |
| HY_CMBS | -0.09 | 0.62 | 0.54 | 1.00 |
| *Standard CMBS sample period from Q2 2000 to Q2 2006* | | | | |
| NCREIF | 1.00 | | | |
| LEVY_CM | -0.21 | 1.00 | | |
| IG_CMBS | -0.24 | 0.96 | 1.00 | |
| HY_CMBS | -0.01 | 0.84 | 0.80 | 1.00 |

Chart 3. Time Series Chart of the NCREIF, LEVY_CM, IG_CMBS and HY_CMBS




Note: NCREIF (NCREIF Commercial Property Index Return); LEVY_CM (Giliberto-Levy Commercial Mortgage Index Return), IG_CMBS (Lehman Brother Investment-Grade CMBS Index Return), and HY_CMBS (Lehman Brother High-Yield CMBS Index Return).