



Do Mortgage REITs Reflect the Underlying MBS Market Performance?

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Abstract: Equity REITs own and operate income-producing real estate properties, while mortgage REITs (MREITs) invest in mortgage loans and/or mortgage-backed securities (MBS). Since MBS are debt instruments created through securitization of mortgages, the MREIT and MBS markets should be closely related due to the similarity in their underlying asset claim. This study shows that MREITs and the underlying MBS market indices exhibit completely different return and risk characteristics. In addition, returns on MREITs are much more strongly driven by the stock market systematic factors than the underlying MBS market factors. The results are remarkably robust using either daily or monthly data, full sample or subsample data, and residential or commercial MREITs data. While these results suggest possible inefficiency of the MREIT market, we discuss the limitation of this study and implications for future research.

1. Introduction

In the past two decades, dramatic growth in both the equity and debt sides of real estate has led to increasing investor interest in Real Estate Investment Trusts (REITs). As of 2009, there are 142 REITs traded on stock exchanges in the U.S. with a total market capitalization of \$271 billion, which is equivalent to 23 times the total REIT market capitalization 20 years ago. REITs can be classified into one of three categories: equity REITs (EREITs), mortgage REITs (MREITs) or hybrid REITs. EREITs own and operate income-producing real estate

properties, while MREITs invest in mortgage loans and/or mortgage-backed securities (MBS).

There is a large and growing body of research in REITs in recent years. The relationship between REITs, the general equity market, and the property market has been well researched. Okunev and Wilson (1997), Peterson and Hsieh (1997), Liu and Mei (1998), Oppenheimer and Grissom (1998), Glascock, Lu and So (2000), and Clayton and MacKinnon (2001, 2003) examine the integration and segmentation of the markets for REITs, Real Estate, stocks, and bonds. Waggle and Moon (2006) and Waggle and Agrawal (2006) analyze the correlation between REITs, stocks, and bonds in an optimal portfolio setting. Stevenson (2002) and Cotton and Stevenson (2006) examine the volatility spillover between REITs and the broad U.S. equity market indices. At the cross-sectional level, Capozza and Seguin (2000, 2003) and Hartzell, Sun and Titman (2006) examine the effect of corporate governance on the cross-sectional performance of REITs. Chui, Titman, and Wei (2003), Ambrose, Highfield, and Linneman (2005), and Ott, Riddiough, and Yi (2005) examine other cross-sectional determinants of REIT returns, such as size, financing structure, momentum, turnover and analyst coverage. The existing research, however, has focused on the aggregate REIT market and the EREITs, with little guidance on the MREITs. He (1998) analyzes the relationship between the stock prices of EREITs and MREITs while Cotton and Stevenson (2006) examine the return and volatility linkages between EREITs and MREITs. Jirasakuldech and Knight (2005) test the weak-form efficiency of the REITs and find efficiency in EREITs but some return predictability in MREITs. Lee and Chiang (2004) study the EREITs and MREITs and find that existence of informational commonality and substitutability between these two classes of REITs, suggesting that market participants may not have fully understood the differences between the property-based EREITs and the mortgage-based MERITs. While previous research has examined the linkages between MREITs and the general stock, bond and real estate property markets, none has examined the dynamic linkage between the MREITs and the underlying mortgage market in which the MREITs are investing.

Since MREITs are publicly-traded real estate investment funds that invest in unsecuritized or securitized mortgages, and the MBS are debt instruments created through the securitization of mortgages, these two markets should be closely related due to the similarity in their underlying asset claim. The objective of this study is to examine whether the performance of mortgage REITs reflects the

underlying MBS market performance. In addition, since MREITs can be further grouped into two major categories, those who invest in residential mortgage loans or residential MBS, and those who invest in commercial mortgage loans or commercial MBS, we separately examine the linkage between home MREITs and residential MBS, and that between commercial MREITs and commercial MBS.

2. Data and Empirical Analysis

The National Association of Real Estate Investment Trusts, Inc. (NAREIT) has developed REIT indices for all REITs as well as three REIT categories (Equity, Mortgage and Hybrid) since 1972. The NAREIT mortgage REIT index has been further broken down into home financing and commercial financing REIT indices since 2000. We obtained the daily and monthly data from January 2000 to January 2008 on NAREIT mortgage REIT index and the home financing and commercial financing sub-indices from the FTSE.

Table 1.

Daily Descriptive Statistics (in %)

Panel A. Full Sample Period from January 2000 to January 2008

| Variable | Variable Definition | Mean | Median | Maximum | Minimum | Std. Dev. |
|----------|--|--------|--------|---------|---------|-----------|
| TRM | Total Return on Mortgage REITs | 0.059 | 0.141 | 9.233 | -12.902 | 1.329 |
| TRMH | Total Return on Residential Mortgage REITs | 0.062 | 0.146 | 9.250 | -16.428 | 1.432 |
| TRMC | Total Return on Commercial Mortgage REITs | 0.057 | 0.106 | 10.654 | -10.997 | 1.469 |
| TRE | Total Return on Equity REITs | 0.064 | 0.085 | 8.751 | -5.581 | 1.040 |
| TRA | Total Return on All REITs | 0.062 | 0.095 | 8.392 | -5.457 | 1.030 |
| RMBS_T | Total Return on RMBS Index | 0.025 | 0.025 | 1.584 | -1.971 | 0.191 |
| ABHE_T | Total Return on Home Equity ABS Index | 0.015 | 0.025 | 0.993 | -7.803 | 0.278 |
| CMI_T | Total Return on Investment-grade CMBS Index | 0.027 | 0.029 | 1.322 | -1.322 | 0.293 |
| CMH_T | Total Return on High-yield CMBS Index | 0.046 | 0.062 | 6.615 | -7.658 | 0.462 |
| MBS_Y | Yield on MBS Index | 5.733 | 5.584 | 8.123 | 3.479 | 0.893 |
| ABHE_Y | Yield on Home Equity ABS Index | 5.289 | 5.337 | 8.834 | 2.599 | 1.383 |
| CMI_Y | Yield on Investment-grade CMBS Index | 5.398 | 5.359 | 8.327 | 3.212 | 1.111 |
| CMH_Y | Yield on High-yield CMBS Index | 12.208 | 11.818 | 15.243 | 9.803 | 1.261 |
| CPI_Y | Yield on Investment-grade Corporate Bond Index | 5.806 | 5.684 | 8.512 | 3.769 | 1.055 |
| CPH_Y | Yield on High-yield Corporate Bond Index | 9.886 | 8.733 | 14.929 | 6.737 | 2.361 |
| HMYSP | Yield Spread between Home Equity ABS and MBS | -0.444 | -0.458 | 3.901 | -2.088 | 0.776 |
| CMYSP | Yield Spread between High-Yield and Investment-Grade CMBS | 6.809 | 6.604 | 9.531 | 5.370 | 0.882 |
| CPYSP | Yield Spread between High-Yield and Investment-Grade Corporate Bonds | 4.081 | 3.484 | 8.381 | 1.559 | 1.756 |
| SPTR | Total Return on S&P 500 Index | 0.010 | 0.046 | 5.734 | -5.828 | 1.121 |
| ERM | Excess Return on the Stock Market | 0.001 | 0.050 | 5.310 | -6.650 | 1.127 |
| SMB | Small minus Big Stock Return | 0.015 | 0.030 | 2.900 | -4.570 | 0.607 |
| HML | High minus Low Book-to-market Stock Return | 0.041 | 0.030 | 3.360 | -4.930 | 0.627 |

Table 1. (Continued)**Daily Descriptive Statistics (in %)**

Panel B. First Half (January 2000- December 2003) and Second Half (January 2004- January 2008)

| Variable | First Half (January 2000- December 2003) | | | | | Second Half (January 2004- January 2008) | | | | |
|----------|--|--------|---------|---------|-----------|--|--------|---------|---------|-----------|
| | Mean | Median | Maximum | Minimum | Std. Dev. | Mean | Median | Maximum | Minimum | Std. Dev. |
| T R M | 0.151 | 0.214 | 5.616 | -5.419 | 1.026 | -0.030 | 0.056 | 9.233 | -12.902 | 1.564 |
| TRMH | 0.148 | 0.227 | 5.519 | -7.305 | 1.172 | -0.022 | 0.053 | 9.250 | -16.428 | 1.644 |
| TRMC | 0.155 | 0.185 | 5.953 | -7.510 | 1.112 | -0.039 | 0.012 | 10.654 | -10.997 | 1.743 |
| T R E | 0.076 | 0.075 | 4.762 | -3.453 | 0.764 | 0.053 | 0.097 | 8.751 | -5.581 | 1.253 |
| T R A | 0.079 | 0.097 | 4.683 | -3.361 | 0.756 | 0.046 | 0.093 | 8.392 | -5.457 | 1.240 |
| RMBS_T | 0.030 | 0.030 | 1.584 | -1.971 | 0.200 | 0.021 | 0.021 | 0.928 | -0.817 | 0.181 |
| ABHE_T | 0.030 | 0.037 | 0.612 | -0.658 | 0.143 | 0.001 | 0.013 | 0.993 | -7.803 | 0.363 |
| CMI_T | 0.041 | 0.056 | 1.197 | -1.322 | 0.334 | 0.013 | 0.016 | 1.322 | -1.226 | 0.246 |
| CMH_T | 0.057 | 0.087 | 6.615 | -5.905 | 0.482 | 0.035 | 0.046 | 4.863 | -7.658 | 0.442 |
| RMBS_Y | 6.076 | 6.137 | 8.123 | 3.479 | 1.103 | 5.399 | 5.478 | 6.227 | 4.436 | 0.403 |
| ABHE_Y | 5.431 | 5.272 | 8.354 | 2.599 | 1.604 | 5.151 | 5.394 | 8.834 | 2.831 | 1.110 |
| CMI_Y | 5.753 | 5.806 | 8.327 | 3.212 | 1.369 | 5.051 | 5.227 | 6.050 | 3.510 | 0.607 |
| CMH_Y | 12.835 | 13.051 | 14.709 | 10.352 | 0.975 | 11.598 | 11.413 | 15.243 | 9.803 | 1.207 |
| CPI_Y | 6.306 | 6.380 | 8.512 | 3.769 | 1.204 | 5.318 | 5.482 | 6.269 | 3.967 | 0.549 |
| CPH_Y | 11.893 | 12.332 | 14.929 | 7.364 | 1.695 | 7.936 | 7.884 | 10.394 | 6.737 | 0.693 |
| HMYSP | -0.645 | -0.597 | 0.464 | -2.088 | 0.601 | -0.249 | -0.104 | 3.901 | -1.732 | 0.872 |
| CMYSP | 7.079 | 7.232 | 7.867 | 6.057 | 0.516 | 6.547 | 6.144 | 9.531 | 5.370 | 1.066 |
| CPYSP | 5.586 | 5.578 | 8.381 | 2.892 | 1.222 | 2.619 | 2.587 | 5.029 | 1.559 | 0.533 |
| S P T R | -0.011 | -0.020 | 5.734 | -5.828 | 1.383 | 0.030 | 0.077 | 2.943 | -3.464 | 0.785 |
| E R M | -0.021 | 0.000 | 5.310 | -6.650 | 1.389 | 0.022 | 0.080 | 2.930 | -3.430 | 0.791 |
| S M B | 0.036 | 0.070 | 2.900 | -4.570 | 0.729 | -0.005 | -0.010 | 1.620 | -1.520 | 0.457 |
| H M L | 0.065 | 0.060 | 3.360 | -4.930 | 0.836 | 0.018 | 0.010 | 1.390 | -1.360 | 0.307 |

Introduced in 1986, the Lehman Brothers MBS index covers the agency residential MBS (RMBS). As the investor base for Commercial MBS (CMBS) broadened in the late 1990s, Lehman Brothers introduced the investment-grade and high-yield CMBS indices in January 1999. Since the Lehman RMBS index is strictly investment-grade, We also use the home-equity Asset-backed Securities (HE ABS) index to serve as a proxy for the non-conforming or subprime residential mortgages that have been packaged into home equity ABS.

In November 2008, the Lehman Brother fixed income indices were rebranded to Barcap fixed income indices (see Barclays Capital (2008)). Both daily and monthly data from January 2000 to January 2008 on the total returns of RMBS, HE ABS, investment-grade CMBS, high-yield CMBS indices were obtained from the Barclays Capital (see Xu and Fung (2005) and Xu (2007) for detailed discussions on the Lehman residential and commercial MBS indices).

Table 2.**Daily Correlations**

Panel A. Full Sample Period from January 2000 to January 2008

| | TRM | TRMH | TRMC | TRE | TRA | | TRM | TRMH | TRMC | TRE | TRA |
|---------------|--------|--------|--------|--------|--------|-------------------|--------|--------|--------|--------|--------|
| TRM | 1.000 | 0.958 | 0.844 | 0.671 | 0.707 | TRM(-1) | 0.120 | 0.096 | 0.132 | 0.093 | 0.098 |
| TRMH | 0.958 | 1.000 | 0.659 | 0.594 | 0.630 | TRMH(-1) | 0.139 | 0.113 | 0.149 | 0.110 | 0.115 |
| TRMC | 0.844 | 0.659 | 1.000 | 0.658 | 0.686 | TRMC(-1) | 0.058 | 0.042 | 0.070 | 0.039 | 0.042 |
| TRE | 0.671 | 0.594 | 0.658 | 1.000 | 0.998 | TRE(-1) | 0.042 | 0.024 | 0.060 | 0.079 | 0.079 |
| TRA | 0.707 | 0.630 | 0.686 | 0.998 | 1.000 | TRA(-1) | 0.048 | 0.030 | 0.067 | 0.082 | 0.082 |
| RMBS_T | 0.037 | 0.060 | -0.016 | -0.008 | -0.005 | RMBS_T(-1) | 0.039 | 0.048 | 0.018 | 0.021 | 0.023 |
| ABHE_T | -0.022 | -0.003 | -0.056 | -0.079 | -0.077 | ABHE_T(-1) | 0.036 | 0.035 | 0.035 | 0.029 | 0.031 |
| CMI_T | -0.024 | -0.007 | -0.051 | -0.068 | -0.067 | CMI_T(-1) | 0.032 | 0.041 | 0.010 | 0.009 | 0.011 |
| CMH_T | -0.021 | -0.005 | -0.048 | -0.087 | -0.084 | CMH_T(-1) | 0.076 | 0.072 | 0.068 | 0.018 | 0.023 |
| RMBS_Y | -0.003 | -0.002 | -0.006 | -0.004 | -0.004 | RMBS_Y(-1) | 0.000 | 0.002 | -0.006 | -0.004 | -0.004 |
| ABHE_Y | -0.013 | -0.005 | -0.026 | -0.020 | -0.019 | ABHE_Y(-1) | -0.008 | -0.001 | -0.022 | -0.020 | -0.019 |
| CMI_Y | -0.004 | -0.002 | -0.010 | -0.007 | -0.006 | CMI_Y(-1) | 0.000 | 0.002 | -0.007 | -0.004 | -0.004 |
| CMH_Y | 0.026 | 0.031 | 0.009 | -0.018 | -0.014 | CMH_Y(-1) | 0.030 | 0.035 | 0.012 | -0.020 | -0.016 |
| CPI_Y | 0.011 | 0.012 | 0.003 | -0.004 | -0.003 | CPI_Y(-1) | 0.013 | 0.015 | 0.004 | -0.006 | -0.005 |
| CPH_Y | 0.060 | 0.060 | 0.043 | 0.006 | 0.010 | CPH_Y(-1) | 0.062 | 0.063 | 0.045 | 0.004 | 0.008 |
| HMYSP | -0.020 | -0.006 | -0.039 | -0.031 | -0.030 | HMYSP(-1) | -0.015 | -0.003 | -0.032 | -0.031 | -0.030 |
| CMYSP | 0.042 | 0.046 | 0.026 | -0.017 | -0.012 | CMYSP(-1) | 0.043 | 0.048 | 0.026 | -0.022 | -0.017 |
| CPYSP | 0.074 | 0.074 | 0.056 | 0.011 | 0.016 | CPYSP(-1) | 0.076 | 0.075 | 0.058 | 0.009 | 0.014 |
| SPTR | 0.438 | 0.385 | 0.439 | 0.513 | 0.522 | SPTR(-1) | 0.045 | 0.035 | 0.052 | 0.012 | 0.015 |
| ERM | 0.450 | 0.394 | 0.451 | 0.522 | 0.531 | ERM(-1) | 0.043 | 0.035 | 0.047 | 0.011 | 0.013 |
| SMB | 0.209 | 0.178 | 0.217 | 0.175 | 0.182 | SMB(-1) | 0.011 | 0.010 | 0.004 | 0.019 | 0.019 |
| HML | -0.022 | -0.027 | -0.008 | -0.058 | -0.058 | HML(-1) | -0.031 | -0.034 | -0.022 | 0.021 | 0.019 |

Examination of the descriptive statistics from Table 1 reveals that return behavior of MREITs is dramatically different from that of the MBS. As shown in Panel A, mean daily returns on all MREITs, residential MREITs, and commercial MREITs are 0.059%, 0.062%, and 0.057%, respectively. However, the mean daily returns on RMBS, HE ABS, investment-grade CMBS, and high-yield CMBS are only 0.025%, 0.015%, 0.027% and 0.046%, respectively. On other hand, the standard deviations of the residential and commercial mortgage REITs indices are 1.432% and 1.469%, while the standard deviations of RMBS and investment-grade CMBS indices are only 0.191% and 0.293%. We further split the sample into first half (Jan. 2000 to Dec. 2003) and second half (Jan. 2004 to Jan. 2008). The descriptive statistics in Panel B of Table 1 show high positive mean returns for the MREITs in the first half and negative mean returns in the second half, while the MBS indices deliver positive mean returns in both periods. Standard deviations of MREITs are much higher than those of MBS indices in both periods.

Table 2. (Continued)**Daily Correlations**

Panel B. First Half (January 2000- December 2003)

| | TRM | TRMH | TRMC | TRE | TRA | | TRM | TRMH | TRMC | TRE | TRA |
|--------|--------|--------|--------|--------|--------|------------|--------|--------|--------|--------|--------|
| TRM | 1.000 | 0.949 | 0.766 | 0.523 | 0.557 | TRM(-1) | 0.183 | 0.169 | 0.150 | 0.137 | 0.145 |
| TRMH | 0.949 | 1.000 | 0.531 | 0.477 | 0.510 | TRMH(-1) | 0.169 | 0.149 | 0.149 | 0.134 | 0.141 |
| TRMC | 0.766 | 0.531 | 1.000 | 0.445 | 0.471 | TRMC(-1) | 0.145 | 0.144 | 0.104 | 0.099 | 0.105 |
| TRE | 0.523 | 0.477 | 0.445 | 1.000 | 0.999 | TRE(-1) | 0.129 | 0.109 | 0.119 | 0.151 | 0.154 |
| TRA | 0.557 | 0.510 | 0.471 | 0.999 | 1.000 | TRA(-1) | 0.136 | 0.115 | 0.125 | 0.155 | 0.159 |
| RMBS_T | -0.087 | -0.075 | -0.088 | -0.148 | -0.148 | RMBS_T(-1) | 0.022 | 0.049 | -0.026 | -0.032 | -0.030 |
| ABHE_T | -0.126 | -0.110 | -0.123 | -0.227 | -0.227 | ABHE_T(-1) | 0.033 | 0.042 | 0.008 | 0.007 | 0.009 |
| CMI_T | -0.133 | -0.116 | -0.129 | -0.213 | -0.213 | CMI_T(-1) | 0.020 | 0.032 | -0.001 | -0.005 | -0.004 |
| CMH_T | -0.097 | -0.088 | -0.091 | -0.177 | -0.175 | CMH_T(-1) | -0.021 | -0.013 | -0.025 | -0.003 | -0.004 |
| RMBS_Y | -0.028 | -0.020 | -0.038 | 0.002 | -0.001 | RMBS_Y(-1) | -0.030 | -0.023 | -0.039 | -0.002 | -0.005 |
| ABHE_Y | -0.031 | -0.019 | -0.048 | -0.007 | -0.010 | ABHE_Y(-1) | -0.029 | -0.019 | -0.043 | -0.006 | -0.008 |
| CMI_Y | -0.027 | -0.018 | -0.040 | -0.001 | -0.004 | CMI_Y(-1) | -0.027 | -0.019 | -0.037 | 0.001 | -0.002 |
| CMH_Y | -0.018 | -0.013 | -0.026 | 0.006 | 0.004 | CMH_Y(-1) | -0.019 | -0.016 | -0.024 | 0.007 | 0.005 |
| CPI_Y | -0.027 | -0.014 | -0.044 | -0.009 | -0.011 | CPI_Y(-1) | -0.026 | -0.016 | -0.040 | -0.010 | -0.013 |
| CPH_Y | -0.011 | 0.015 | -0.055 | -0.030 | -0.030 | CPH_Y(-1) | -0.010 | 0.016 | -0.054 | -0.038 | -0.039 |
| HMYSP | -0.032 | -0.014 | -0.058 | -0.022 | -0.023 | HMYSP(-1) | -0.023 | -0.009 | -0.043 | -0.013 | -0.014 |
| CMYSP | 0.038 | 0.023 | 0.057 | 0.014 | 0.017 | CMYSP(-1) | 0.034 | 0.020 | 0.051 | 0.011 | 0.013 |
| CPYSP | 0.012 | 0.035 | -0.032 | -0.032 | -0.031 | CPYSP(-1) | 0.012 | 0.038 | -0.035 | -0.043 | -0.041 |
| SPTR | 0.405 | 0.359 | 0.371 | 0.530 | 0.539 | SPTR(-1) | 0.118 | 0.096 | 0.129 | 0.036 | 0.042 |
| ERM | 0.410 | 0.363 | 0.377 | 0.534 | 0.543 | ERM(-1) | 0.113 | 0.093 | 0.120 | 0.027 | 0.033 |
| SMB | 0.082 | 0.077 | 0.061 | 0.010 | 0.014 | SMB(-1) | -0.058 | -0.051 | -0.058 | -0.034 | -0.037 |
| HML | -0.098 | -0.093 | -0.080 | -0.158 | -0.160 | HML(-1) | -0.067 | -0.055 | -0.080 | 0.032 | 0.029 |

Table 2 performs correlation analysis between MREIT and MBS indices. The contemporaneous correlation is only 0.060 between the residential MREIT and RMBS return indices, and -0.051 between the commercial MREIT and CMBS return indices. In order to see whether this low correlation is due to delayed response, we check for the correlations between the total returns on MREIT indices and the previous day's MBS indices. The lag 1 correlation is only 0.048 between the residential MREIT and RMBS indices, and 0.010 between the commercial MREIT and CMBS indices. In addition, the low correlation between MREITs and MBS is robust for the residential or commercial markets, using the investment-grade or high-yield indices, and for the first-half or second-half of the sample periods.

Another interesting observation from Table 2 is the high contemporaneous correlation between MREITs and stock market systematic factors. The return on MREITs has a 0.450 and 0.209 correlation with the stock market excess return and the stock market size factor, much higher than its correlation with the MBS market

return. This correlation is strong in the first half and even stronger in the second half. As for the correlation between MREITs and the corporate credit spread (yield spread between high-yield and investment-grade corporate bonds), it is very low (0.012) in the first half but much higher (0.061) in the second half.

Table 2. (Continued)

Daily Correlations

Panel C. Second Half (January 2004- January 2008)

| | TRM | TRMH | TRMC | TRE | TRA | | TRM | TRMH | TRMC | TRE | TRA |
|---------------|--------|--------|--------|--------|--------|-------------------|--------|--------|--------|--------|--------|
| TRM | 1.000 | 0.963 | 0.874 | 0.728 | 0.765 | TRM(-1) | 0.088 | 0.057 | 0.118 | 0.075 | 0.079 |
| TRMH | 0.963 | 1.000 | 0.714 | 0.645 | 0.683 | TRMH(-1) | 0.121 | 0.090 | 0.145 | 0.100 | 0.104 |
| TRMC | 0.874 | 0.714 | 1.000 | 0.737 | 0.765 | TRMC(-1) | 0.017 | -0.008 | 0.050 | 0.016 | 0.018 |
| TRE | 0.728 | 0.645 | 0.737 | 1.000 | 0.998 | TRE(-1) | 0.007 | -0.012 | 0.036 | 0.053 | 0.052 |
| TRA | 0.765 | 0.683 | 0.765 | 0.998 | 1.000 | TRA(-1) | 0.013 | -0.008 | 0.043 | 0.055 | 0.054 |
| RMBS_T | 0.123 | 0.162 | 0.029 | 0.080 | 0.085 | RMBS_T(-1) | 0.049 | 0.046 | 0.046 | 0.057 | 0.058 |
| ABHE_T | -0.002 | 0.022 | -0.046 | -0.048 | -0.046 | ABHE_T(-1) | 0.034 | 0.030 | 0.039 | 0.035 | 0.036 |
| CMI_T | 0.060 | 0.089 | 0.000 | 0.035 | 0.037 | CMI_T(-1) | 0.039 | 0.048 | 0.013 | 0.021 | 0.024 |
| CMH_T | 0.027 | 0.055 | -0.025 | -0.037 | -0.032 | CMH_T(-1) | 0.144 | 0.136 | 0.132 | 0.032 | 0.041 |
| RMBS_Y | -0.062 | -0.057 | -0.058 | -0.039 | -0.041 | RMBS_Y(-1) | -0.044 | -0.035 | -0.051 | -0.029 | -0.030 |
| ABHE_Y | -0.014 | -0.005 | -0.026 | -0.038 | -0.036 | ABHE_Y(-1) | -0.006 | 0.004 | -0.022 | -0.038 | -0.036 |
| CMI_Y | -0.042 | -0.037 | -0.043 | -0.034 | -0.035 | CMI_Y(-1) | -0.029 | -0.022 | -0.035 | -0.026 | -0.026 |
| CMH_Y | -0.006 | 0.010 | -0.032 | -0.047 | -0.044 | CMH_Y(-1) | 0.004 | 0.021 | -0.025 | -0.047 | -0.043 |
| CPI_Y | -0.035 | -0.030 | -0.036 | -0.027 | -0.028 | CPI_Y(-1) | -0.025 | -0.017 | -0.034 | -0.024 | -0.024 |
| CPH_Y | 0.020 | 0.035 | -0.011 | -0.004 | -0.001 | CPH_Y(-1) | 0.043 | 0.053 | 0.016 | 0.020 | 0.023 |
| HMYSP | 0.011 | 0.020 | -0.007 | -0.030 | -0.027 | HMYSP(-1) | 0.013 | 0.022 | -0.005 | -0.035 | -0.031 |
| CMYSP | 0.018 | 0.033 | -0.011 | -0.034 | -0.030 | CMYSP(-1) | 0.021 | 0.036 | -0.008 | -0.038 | -0.034 |
| CPYSP | 0.061 | 0.077 | 0.024 | 0.024 | 0.027 | CPYSP(-1) | 0.082 | 0.088 | 0.056 | 0.051 | 0.055 |
| SPTR | 0.595 | 0.506 | 0.637 | 0.650 | 0.661 | SPTR(-1) | -0.022 | -0.031 | -0.014 | -0.008 | -0.008 |
| ERM | 0.616 | 0.525 | 0.658 | 0.666 | 0.678 | ERM(-1) | -0.020 | -0.027 | -0.016 | -0.002 | -0.003 |
| SMB | 0.376 | 0.315 | 0.411 | 0.368 | 0.378 | SMB(-1) | 0.076 | 0.074 | 0.060 | 0.072 | 0.075 |
| HML | 0.085 | 0.073 | 0.098 | 0.054 | 0.059 | HML(-1) | 0.002 | -0.025 | 0.051 | 0.016 | 0.015 |

Note: See Panel A of Table 1 for the variable definitions. Variable Name (-1) stands for the lag one of the variable.

To further examine the relationship between MREITs and MBS, we also include the Fama-French three factors (i.e., the stock market excess return, size factor, and book to market value factor), the corporate credit spread, and lag squared return on MREITs (volatility proxy) in the regressions analysis. Table 3 presents the regression results for four different models: model 1 is a simple regression of MREITs return on the MBS return; model 2 is a regression of MREITs return on the Fama-French three factors (stock market excess return, size factor, and book to market value factor); model 3 is based on the MBS return and the Fama-French three factors; model 4 is based on the MBS return, the Fama-French three factors, the corporate credit spread, and lag squared return on

MREITs. Panels A, B, C present the regression analysis for the full sample period, first half and second half, respectively.

Table 3.

Regression Estimates for Daily Returns on Mortgage REITs

Panel A. Full Sample Period from January 2000 to January 2008

| Variable | Variable Definition | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|-------------------------|--|--------------|---------------|---------------|----------------|---------------|----------------|---------------|----------------|
| C | Intercept | 0.001 | <i>(1.80)</i> | 0.0003 | (0.45) | 0.0006 | (-0.27) | -0.002 | <i>(-4.35)</i> |
| RMBS_T | Total Return on MBS Index | 0.253 | (1.33) | | | 0.713 | <i>(4.36)</i> | 0.718 | <i>(4.42)</i> |
| ERM | Excess Return on the Stock Market | | | 0.786 | <i>(20.40)</i> | 0.799 | <i>(20.40)</i> | 0.821 | <i>(24.26)</i> |
| SMB | Small minus Big Stock Return | | | 0.924 | <i>(15.19)</i> | 0.914 | <i>(14.97)</i> | 0.947 | <i>(17.26)</i> |
| HML | High minus Low Book-to-market Stock Return | | | 0.605 | <i>(12.40)</i> | 0.611 | <i>(12.57)</i> | 0.624 | <i>(12.89)</i> |
| CPYSP | Corporate Bond Credit Spread | | | | | | | 0.052 | <i>(4.12)</i> |
| TRM21 | Lag 1 Squared Total Return on Mortgage REITs | | | | | | | 1.469 | <i>(1.76)</i> |
| F-test | | 2.65 | | 360.42 | | 278.19 | | 199.09 | |
| Adjusted R ² | | 0.082% | | 34.679% | | 35.483% | | 37.147% | |

Panel B. First Half (January 2000- December 2003)

| Variable | Variable Definition | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|-------------------------|--|---------------|----------------|---------------|----------------|--------------|----------------|--------------|----------------|
| C | Intercept | 0.002 | <i>(5.09)</i> | 0.001 | <i>(3.71)</i> | 0.001 | <i>(3.54)</i> | 0.000 | (-0.38) |
| RMBS_T | Total Return on MBS Index | -0.454 | <i>(-2.87)</i> | | | 0.077 | (0.51) | 0.113 | (0.75) |
| ERM | Excess Return on the Stock Market | | | 0.546 | <i>(12.25)</i> | 0.547 | <i>(11.90)</i> | 0.572 | <i>(15.16)</i> |
| SMB | Small minus Big Stock Return | | | 0.600 | <i>(8.64)</i> | 0.598 | <i>(8.48)</i> | 0.643 | <i>(10.64)</i> |
| HML | High minus Low Book-to-market Stock Return | | | 0.373 | <i>(6.33)</i> | 0.373 | <i>(6.29)</i> | 0.406 | <i>(7.04)</i> |
| CPYSP | Corporate Bond Credit Spread | | | | | | | 0.021 | (0.92) |
| TRM21 | Lag 1 Squared Total Return on Mortgage REITs | | | | | | | 2.753 | <i>(1.65)</i> |
| F-test | | 7.78 | | 128.52 | | 94.74 | | 68.24 | |
| Adjusted R ² | | 0.677% | | 27.630% | | 27.370% | | 28.952% | |

Panel C. Second Half (January 2004- January 2008)

| Variable | Variable Definition | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|-------------------------|--|--------------|---------------|---------------|----------------|---------------|----------------|---------------|----------------|
| C | Intercept | -0.001 | (-1.08) | -0.001 | <i>(-1.80)</i> | -0.001 | <i>(-2.48)</i> | -0.006 | <i>(-2.95)</i> |
| RMBS_T | Total Return on MBS Index | 1.058 | <i>(3.11)</i> | | | 1.280 | <i>(5.12)</i> | 1.233 | <i>(4.98)</i> |
| ERM | Excess Return on the Stock Market | | | 1.118 | <i>(14.49)</i> | 1.134 | <i>(14.80)</i> | 1.137 | <i>(15.43)</i> |
| SMB | Small minus Big Stock Return | | | 0.908 | <i>(6.21)</i> | 0.802 | <i>(5.69)</i> | 0.830 | <i>(5.99)</i> |
| HML | High minus Low Book-to-market Stock Return | | | 0.586 | <i>(5.11)</i> | 0.581 | <i>(5.22)</i> | 0.585 | <i>(5.43)</i> |
| CPYSP | Corporate Bond Credit Spread | | | | | | | 0.169 | <i>(2.21)</i> |
| TRM21 | Lag 1 Squared Total Return on Mortgage REITs | | | | | | | 1.220 | (1.32) |
| F-test | | 15.59 | | 255.46 | | 205.93 | | 141.74 | |
| Adjusted R ² | | 1.409% | | 42.614% | | 44.556% | | 45.291% | |

The t-statistics in parentheses are computed using White's heteroskedasticity-consistent variance-covariance estimator. **Bold** -- Significant at 5%; **Bold and Italic** -- Significant at 10%

Table 4.**Regression Estimates for Daily Returns on Residential Mortgage REITs vs. Commercial Mortgage REITs**

Panel A. Residential Mortgage REITs

| Variable | Variable Definition | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|-------------------------|--|--------------|---------------|---------------|----------------|---------------|----------------|---------------|----------------|
| C | Intercept | 0.001 | (1.64) | 0.000 | (0.65) | 0.000 | (-0.07) | -0.003 | (-4.13) |
| RMBS_T | Total Return on Residential MBS Index | 0.440 | (2.01) | | | 0.876 | (4.25) | 0.880 | (4.28) |
| ERM | Excess Return on the Stock Market | | | 0.731 | (16.90) | 0.746 | (17.03) | 0.770 | (19.73) |
| SMB | Small minus Big Stock Return | | | 0.838 | (12.02) | 0.824 | (11.80) | 0.856 | (13.28) |
| HML | High minus Low Book-to-market Stock Return | | | 0.545 | (9.17) | 0.553 | (9.33) | 0.567 | (9.52) |
| CPYSP | Corporate Bond Credit Spread | | | | | | | 0.056 | (3.94) |
| TRMH21 | Lag 1 Squared Return on Residential Mortgage REITs | | | | | | | 1.468 | (2.15) |
| F-test | | 6.92 | | 233.48 | | 184.27 | | 158.47 | |
| Adjusted R ² | | 0.293% | | 25.580% | | 26.686% | | 28.136% | |

Panel B. Commercial Mortgage REITs

| Variable | Variable Definition | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|-------------------------|---|---------------|----------------|---------------|----------------|---------------|----------------|---------------|----------------|
| C | Intercept | 0.001 | (1.89) | 0.000 | (0.65) | 0.000 | (0.04) | 0.000 | (-0.41) |
| CMI_T | Total Return on Investment-grade CMBS Index | -0.259 | (-2.06) | | | 0.890 | (20.23) | 0.311 | (3.05) |
| ERM | Excess Return on the Stock Market | | | 0.731 | (16.90) | 1.082 | (15.11) | 0.909 | (20.08) |
| SMB | Small minus Big Stock Return | | | 0.838 | (12.02) | 0.708 | (13.70) | 1.081 | (15.07) |
| HML | High minus Low Book-to-market Stock Return | | | 0.545 | (9.17) | 0.000 | (0.04) | 0.709 | (13.75) |
| CPYSP | Corporate Bond Credit Spread | | | | | | | 0.311 | (3.05) |
| TRMC21 | Lag 1 Squared Return on Commercial Mortgage REITs | | | | | | | 0.000 | (-0.41) |
| F-test | | 5.40 | | 395.13 | | 298.10 | | 245.81 | |
| Adjusted R ² | | 0.218% | | 36.818% | | 37.109% | | 37.838% | |

The t-statistics in parentheses are computed using White's heteroskedasticity-consistent variance-covariance estimator. **Bold** -- Significant at 5%; **Bold and Italic** -- Significant at 10%

The most striking result from Panel A of Table 3 is that the MBS return is statistically insignificant and it only explains 0.08% of the variation in MREITs return (see model 1). Panels B and C show that model 1's R² is 0.68% in first half and 1.41% in the second half, confirming the low explanatory power of MBS return for the MREIT return. In comparison, the Fama-French stock market three

factors are highly significant and explain 34.68% of the variation in MREITs return (see model 2). All three Fama-French three factors are positive and highly significant. With the inclusion of both MBS return and Fama-French stock market three factors, the MBS return variable is also positive and statistically significant (see model 3). However, model 3's adjusted R2 is only slightly higher than that of model 2. With the addition of the corporate credit spread and lag MREITs return volatility, the adjusted R2 of model 4 only improved by less than 2%. These two additional variables are positive and statistically significant for the full sample period. The corporate credit spread variable has a stronger significance in the second half while the lag MREITs return volatility variable is more significant in the first half.

Table 4 examines the relationship between home MREITs and RMBS returns in Panel A and the relationship between commercial MREITs and CMBS returns in Panel B. Consistent with the results from Table 3, the MBS return in the residential and commercial markets both show an extremely low explanatory power for the return on home MREITs and commercial MREITs (see model 1), and stock market factors show much higher explanatory power for the MREITs return (see model 2). Although the MBS return becomes significant in model 3, its incremental explanatory power is very low. The corporate bond credit spread appears to be significant in model 4 for both groups, while only the lagged return volatility is significant for the residential MREITs.

Table 5.
The Top Ten Most Volatile Days of REITs (January 2000 to January 2008)

| | Mortgage REITs | | Residential Mortgage REITs | | Commercial Mortgage REITs | | Equity REITs | |
|--------------------------------------|----------------|---------|----------------------------|---------|---------------------------|---------|--------------|--------|
| | Date | Return | Date | Return | Date | Return | Date | Return |
| 1st Biggest % Loss | 20070814 | -12.90% | 20070814 | -12.90% | 20070803 | -11.00% | 20071211 | -5.58% |
| 2nd Biggest % Loss | 20040412 | -8.69% | 20070305 | -8.14% | 20070731 | -9.61% | 20071126 | -5.21% |
| 3rd Biggest % Loss | 20070731 | -8.58% | 20040412 | -8.69% | 20040412 | -8.85% | 20040412 | -4.99% |
| 4th Biggest % Loss | 20070305 | -8.14% | 20070731 | -8.58% | 20070801 | -7.76% | 20040406 | -4.15% |
| 5th Biggest % Loss | 20070313 | -6.57% | 20010702 | -4.89% | 20020701 | -7.51% | 20071101 | -3.89% |
| | | | | | | | | |
| 5th Biggest % Gain | 20070808 | 5.52% | 20020726 | 5.62% | 20020726 | 5.95% | 20071113 | 2.02% |
| 4th Biggest % Gain | 20070918 | 5.56% | 20070918 | 5.56% | 20070816 | 6.18% | 20071128 | 4.53% |
| 3rd Biggest % Gain | 20020726 | 5.62% | 20080122 | 5.35% | 20070817 | 9.20% | 20070808 | 5.52% |
| 2nd Biggest % Gain | 20070816 | 7.84% | 20070816 | 7.84% | 20070808 | 9.88% | 20020729 | 4.08% |
| 1st Biggest % Gain | 20070817 | 9.23% | 20070817 | 9.23% | 20080123 | 10.65% | 20080123 | 4.61% |

Table 6.**The Top Ten Most Volatile Days of MBS (January 2000 to January 2008)**

| | Agency Residential MBS Index | | Home Equity ABS Index | | Investment-grade CMBS Index | | High-yield CMBS Index | |
|--------------------------------------|---------------------------------|--------|--------------------------|--------|--------------------------------|--------|--------------------------|--------|
| | Date | Return | Date | Return | Date | Return | Date | Return |
| 1st Biggest % Loss | 20000512 | -1.97% | 20071130 | -7.80% | 20011115 | -1.32% | 20070730 | -7.66% |
| 2nd Biggest % Loss | 20080124 | -0.82% | 20080131 | -5.70% | 20040402 | -1.23% | 20030508 | -5.90% |
| 3rd Biggest % Loss | 20030813 | -0.75% | 20070830 | -2.60% | 20011205 | -1.21% | 20070806 | -3.53% |
| 4th Biggest % Loss | 20040507 | -0.73% | 20071228 | -2.52% | 20030813 | -1.17% | 20071026 | -3.14% |
| 5th Biggest % Loss | 20070920 | -0.71% | 20080124 | -1.06% | 20010103 | -1.03% | 20071127 | -2.30% |
| | | | | | | | | |
| 5th Biggest % Gain | 20070907 | 0.71% | 20010102 | 0.61% | 20040305 | 0.98% | 20020823 | 1.36% |
| 4th Biggest % Gain | 20000720 | 0.72% | 20040806 | 0.65% | 20010104 | 0.99% | 20020913 | 1.44% |
| 3rd Biggest % Gain | 20071126 | 0.78% | 20080102 | 0.66% | 20040806 | 1.07% | 20050506 | 1.85% |
| 2nd Biggest % Gain | 20040615 | 0.93% | 20080122 | 0.95% | 20010102 | 1.20% | 20040617 | 4.86% |
| 1st Biggest % Gain | 20000511 | 1.58% | 20071126 | 0.99% | 20071126 | 1.32% | 20030507 | 6.61% |

To further examine the robustness of our results, we rank the daily total return on MREITs index and tabulate the 5 days with biggest % loss and 5 days with biggest gain in Table 5. The mortgage REITs have experienced huge swings in daily return, ranging from a daily loss of -12.90% on August 14, 2007 to a daily gain of 9.23% on August 17, 2007. Interestingly, eight of the ten most volatile days from January 2000 to January 2008 occurred in 2007 during the subprime crisis. In Table 6, we rank the MBS total return index and tabulate the 5 days with biggest % loss and 5 days with biggest % gain. The MBS return is much more stable, especially for the agency residential MBS return and the investment-grade CMBS return. The home equity ABS return and the high-yield CMBS return are much more volatile, but their volatilities are still much less than the return volatility on MREITs.

Since the above empirical results are based on daily data, one might be wondering whether the MREITs return would track the MBS return more closely on a monthly basis. In Table 7, we present the descriptive statistics in Panel A, the correlation statistics in Panel B, the most volatile months for MREITs in Panel C, the most volatile months for MBS return in Panel D, and the regression estimates in Panel E. Panel A shows that the mean and volatility of monthly MREIT returns are also dramatically different from those of the related MBS indices. Panel B displays the monthly correlations between the total returns on mortgage REITs and MBS indices, showing greater comovement relative to the daily correlations from Table 2. However, similar to the daily case, the monthly

correlation between mortgage REITs and MBS indices are still much lower than that between mortgage REITs and stock indices. Panels C and D present the top ten most volatile months of mortgage REITs and MBS, respectively. As for the ranking of the most volatile months, April 2004 and July 2007 topped the worst performing months for mortgage REITs, with a total return of -23.74% and -22.11%, respectively. The two worst performing months for residential MBS and commercial MBS both occurred in March 2007 and April 2004, with a decline that is much smaller than that of the mortgage REITs.

Table 7.

Re-examination using Monthly Data (January 2000 to January 2008)

Panel A. Monthly Descriptive Statistics (in %)

| Monthly Descriptive Statistics | Full Sample Period (Jan. 2000-Jan. 2008) | | | | | First Half (Jan. 2000-Dec. 2003) | | | Second Half (Jan. 2004- Jan. 2008) | | |
|-----------------------------------|---|--------|--------|---------|-----------|-------------------------------------|--------|-----------|---------------------------------------|--------|-----------|
| | Mean | Median | Max | Min | Std. Dev. | Mean | Median | Std. Dev. | Mean | Median | Std. Dev. |
| TRM | 1.329 | 2.278 | 14.170 | -23.737 | 6.275 | 3.264 | 3.697 | 4.585 | -0.527 | 1.106 | 7.114 |
| TRMH | 1.354 | 2.066 | 18.514 | -22.940 | 6.646 | 3.152 | 3.594 | 5.347 | -0.370 | 0.665 | 7.336 |
| TRMC | 1.335 | 2.475 | 13.833 | -28.077 | 6.813 | 3.413 | 3.541 | 4.972 | -0.658 | 1.392 | 7.739 |
| TRE | 1.377 | 1.888 | 8.740 | -14.581 | 4.339 | 1.588 | 1.928 | 3.418 | 1.174 | 1.848 | 5.098 |
| TRA | 1.338 | 2.111 | 8.498 | -15.264 | 4.287 | 1.657 | 2.068 | 3.351 | 1.032 | 2.193 | 5.041 |
| RMBS_T | 0.527 | 0.664 | 2.138 | -1.873 | 0.781 | 0.628 | 0.710 | 0.818 | 0.428 | 0.493 | 0.738 |
| ABHE_T | 0.316 | 0.432 | 1.899 | -5.556 | 1.063 | 0.632 | 0.674 | 0.703 | 0.006 | 0.199 | 1.256 |
| CML_T | 0.574 | 0.669 | 3.443 | -4.464 | 1.344 | 0.872 | 1.032 | 1.542 | 0.283 | 0.327 | 1.053 |
| CMH_T | 0.956 | 0.970 | 5.816 | -5.807 | 1.967 | 1.198 | 1.186 | 2.024 | 0.719 | 0.880 | 1.901 |
| RMBS_Y | 5.708 | 5.568 | 7.883 | 3.717 | 0.893 | 6.034 | 6.054 | 1.120 | 5.389 | 5.447 | 0.395 |
| ABHE_Y | 5.309 | 5.298 | 8.834 | 2.817 | 1.435 | 5.384 | 5.226 | 1.617 | 5.236 | 5.428 | 1.245 |
| CML_Y | 5.377 | 5.335 | 8.101 | 3.449 | 1.102 | 5.704 | 5.714 | 1.377 | 5.057 | 5.236 | 0.602 |
| CMH_Y | 12.198 | 11.850 | 15.159 | 9.844 | 1.285 | 12.785 | 13.014 | 0.981 | 11.622 | 11.431 | 1.295 |
| CPLY | 5.776 | 5.661 | 8.271 | 4.039 | 1.051 | 6.249 | 6.277 | 1.225 | 5.313 | 5.483 | 0.544 |
| CPHY | 9.891 | 8.828 | 14.584 | 6.757 | 2.371 | 11.860 | 12.419 | 1.771 | 7.962 | 7.933 | 0.706 |
| HMYSP | -0.399 | -0.456 | 3.901 | -2.067 | 0.895 | -0.650 | -0.604 | 0.606 | -0.154 | -0.093 | 1.057 |
| CMYSP | 6.820 | 6.577 | 9.355 | 5.376 | 0.906 | 7.082 | 7.267 | 0.518 | 6.565 | 6.152 | 1.115 |
| CPYSP | 4.115 | 3.483 | 8.212 | 1.614 | 1.770 | 5.611 | 5.674 | 1.254 | 2.649 | 2.611 | 0.541 |
| SPTR | 0.206 | 0.740 | 9.783 | -10.868 | 3.996 | -0.226 | -0.423 | 5.168 | 0.620 | 1.245 | 2.376 |
| ERM | -0.006 | 0.770 | 8.180 | -10.760 | 4.227 | -0.494 | -0.165 | 5.389 | 0.472 | 0.920 | 2.614 |
| SMB | 0.417 | 0.050 | 22.180 | -16.700 | 4.293 | 0.931 | 0.950 | 5.701 | -0.088 | -0.230 | 2.122 |
| HML | 0.884 | 0.540 | 13.800 | -12.800 | 3.801 | 1.388 | 1.420 | 5.104 | 0.391 | 0.280 | 1.696 |

Note: See Panel A of Table 1 for the variable definitions.

Regression analysis based on monthly data is shown in Panel E of Table 7. The results are largely consistent with those from the daily analysis. Results from Model 1M show that the return on MBS index is insignificant and it fails to explain

the variation in the return on the mortgage REITs, for either the residential or commercial groups. Results from Model 2M demonstrate that the Fama-French stock market factors (i.e., the stock market excess return, size factor, and book to market value factor) are significant drivers of the returns on MREITs and explain the largest proportion of the variation in the return on mortgage REITs. Additional variables such as the MBS return (in models 3M and 4M) and the corporate bond credit spread (in model 4M) are statistically significant but add little explanatory power to those contributed by the Fama-French three factors.

Table 7.(Continued)**Re-examination using Monthly Data (January 2000 to January 2008)**

Panel B. Monthly Correlations

| | TRM | TRMH | TRMC | TRE | TRA | | TRM | TRMH | TRMC | TRE | TRA |
|---------------|--------|--------|--------|--------|--------|-------------------|--------|--------|--------|--------|--------|
| TRM | 1.000 | 0.963 | 0.867 | 0.495 | 0.556 | TRM(-1) | 0.204 | 0.199 | 0.171 | -0.069 | -0.043 |
| TRMH | 0.963 | 1.000 | 0.706 | 0.379 | 0.441 | TRMH(-1) | 0.203 | 0.195 | 0.176 | -0.095 | -0.067 |
| TRMC | 0.867 | 0.706 | 1.000 | 0.613 | 0.661 | TRMC(-1) | 0.149 | 0.153 | 0.111 | -0.018 | -0.002 |
| TRE | 0.495 | 0.379 | 0.613 | 1.000 | 0.997 | TRE(-1) | 0.150 | 0.160 | 0.089 | -0.052 | -0.036 |
| TRA | 0.556 | 0.441 | 0.661 | 0.997 | 1.000 | TRA(-1) | 0.165 | 0.174 | 0.105 | -0.054 | -0.037 |
| RMBS_T | 0.136 | 0.167 | 0.037 | -0.013 | -0.002 | RMBS_T(-1) | 0.080 | 0.050 | 0.133 | 0.053 | 0.062 |
| ABHE_T | 0.177 | 0.149 | 0.187 | 0.249 | 0.247 | ABHE_T(-1) | -0.007 | -0.038 | 0.065 | 0.076 | 0.072 |
| CMI_T | 0.153 | 0.156 | 0.109 | 0.031 | 0.041 | CMI_T(-1) | 0.047 | 0.025 | 0.092 | -0.023 | -0.012 |
| CMH_T | 0.228 | 0.188 | 0.250 | 0.055 | 0.072 | CMH_T(-1) | 0.029 | 0.024 | 0.048 | -0.026 | -0.019 |
| RMBS_Y | 0.005 | 0.001 | 0.000 | 0.018 | 0.017 | RMBS_Y(-1) | 0.057 | 0.062 | 0.021 | 0.019 | 0.022 |
| ABHE_Y | -0.065 | -0.032 | -0.121 | -0.116 | -0.114 | ABHE_Y(-1) | -0.005 | 0.029 | -0.077 | -0.078 | -0.074 |
| CMI_Y | -0.008 | 0.002 | -0.038 | -0.022 | -0.022 | CMI_Y(-1) | 0.047 | 0.057 | 0.003 | 0.000 | 0.003 |
| CMH_Y | 0.098 | 0.136 | -0.004 | -0.112 | -0.095 | CMH_Y(-1) | 0.180 | 0.206 | 0.081 | -0.090 | -0.067 |
| CPI_Y | 0.026 | 0.035 | -0.008 | -0.047 | -0.042 | CPI_Y(-1) | 0.092 | 0.102 | 0.044 | -0.012 | -0.004 |
| CPH_Y | 0.176 | 0.195 | 0.100 | -0.083 | -0.064 | CPH_Y(-1) | 0.264 | 0.271 | 0.196 | -0.006 | 0.017 |
| HMYSP | -0.107 | -0.051 | -0.192 | -0.200 | -0.197 | HMYSP(-1) | -0.072 | -0.018 | -0.159 | -0.158 | -0.155 |
| CMYSP | 0.146 | 0.187 | 0.040 | -0.131 | -0.107 | CMYSP(-1) | 0.196 | 0.220 | 0.111 | -0.127 | -0.099 |
| CPYSP | 0.221 | 0.240 | 0.139 | -0.084 | -0.060 | CPYSP(-1) | 0.299 | 0.302 | 0.236 | -0.001 | 0.025 |
| SPTR | 0.252 | 0.182 | 0.327 | 0.329 | 0.333 | SPTR(-1) | 0.101 | 0.074 | 0.133 | 0.206 | 0.210 |
| ERM | 0.273 | 0.212 | 0.335 | 0.345 | 0.349 | ERM(-1) | 0.101 | 0.065 | 0.145 | 0.167 | 0.171 |
| SMB | 0.190 | 0.207 | 0.145 | 0.171 | 0.179 | SMB(-1) | 0.070 | 0.029 | 0.102 | -0.036 | -0.031 |
| HML | 0.120 | 0.051 | 0.219 | 0.127 | 0.134 | HML(-1) | 0.007 | 0.064 | -0.083 | -0.018 | -0.018 |

Note: See Panel A of Table 1 for the variable definitions. The Variable Name (-1) stands for the lag one of the variable.

Table 7.(Continued)**Re-examination using Monthly Data (January 2000 to January 2008)**

Panel C. The Top Ten Most Volatile Months of REITs (January 2000 to January 2008)

| | Mortgage REITs | | Residential Mortgage REITs | | Commercial Mortgage REITs | | Equity REITs | |
|--------------------------------------|----------------|---------|----------------------------|---------|---------------------------|---------|--------------|---------|
| | Month | Return | Month | Return | Month | Return | Month | Return |
| 1st Biggest % Loss | 200404 | -23.74% | 200404 | -22.94% | 200707 | -28.08% | 200404 | -14.58% |
| 2nd Biggest % Loss | 200707 | -22.11% | 200707 | -18.24% | 200404 | -25.15% | 200711 | -9.07% |
| 3rd Biggest % Loss | 200708 | -12.38% | 200708 | -17.50% | 200706 | -10.92% | 200706 | -9.07% |
| 4th Biggest % Loss | 200702 | -11.43% | 200702 | -12.34% | 200711 | -10.25% | 200501 | -8.40% |
| 5th Biggest % Loss | 200508 | -10.62% | 200508 | -11.91% | 200207 | -9.92% | 200707 | -7.80% |
| | | | | | | | | |
| 5th Biggest % Gain | 200212 | 8.94% | 200204 | 10.67% | 200408 | 10.41% | 200507 | 7.14% |
| 4th Biggest % Gain | 200204 | 10.32% | 200801 | 10.70% | 200208 | 10.68% | 200601 | 7.31% |
| 3rd Biggest % Gain | 200112 | 10.78% | 200112 | 11.02% | 200307 | 10.93% | 200408 | 7.94% |
| 2nd Biggest % Gain | 200304 | 11.19% | 200104 | 12.74% | 200003 | 12.09% | 200701 | 8.42% |
| 1st Biggest % Gain | 200101 | 14.17% | 200101 | 18.51% | 200304 | 13.83% | 200007 | 8.74% |

Panel D. The Top Ten Most Volatile Months of MBS (January 2000 to January 2008)

| | Agency Residential MBS Index | | Home Equity ABS Index | | Investment-grade CMBS Index | | High-yield CMBS Index | |
|--------------------------------------|---------------------------------|--------|--------------------------|--------|--------------------------------|--------|--------------------------|--------|
| | Month | Return | Month | Return | Month | Return | Month | Return |
| 1st Biggest % Loss | 200307 | -1.87% | 200711 | -5.56% | 200307 | -4.46% | 200707 | -5.81% |
| 2nd Biggest % Loss | 200404 | -1.78% | 200712 | -3.35% | 200404 | -3.24% | 200307 | -4.79% |
| 3rd Biggest % Loss | 200203 | -1.06% | 200801 | -3.29% | 200203 | -1.89% | 200404 | -3.00% |
| 4th Biggest % Loss | 200111 | -0.92% | 200404 | -1.70% | 200111 | -1.76% | 200708 | -2.71% |
| 5th Biggest % Loss | 200001 | -0.87% | 200708 | -1.61% | 200801 | -1.71% | 200203 | -1.96% |
| | | | | | | | | |
| 5th Biggest % Gain | 200711 | 1.74% | 200101 | 1.51% | 200204 | 2.80% | 200505 | 4.39% |
| 4th Biggest % Gain | 200107 | 1.78% | 200204 | 1.60% | 200006 | 2.82% | 200408 | 4.57% |
| 3rd Biggest % Gain | 200801 | 1.85% | 200109 | 1.73% | 200212 | 2.84% | 200208 | 4.75% |
| 2nd Biggest % Gain | 200204 | 1.89% | 200107 | 1.82% | 200305 | 3.03% | 200209 | 5.65% |
| 1st Biggest % Gain | 200006 | 2.14% | 200012 | 1.90% | 200309 | 3.44% | 200406 | 5.82% |

Table 7.(Continued)**Re-examination using Monthly Data (January 2000 to January 2008)**

Panel E. Regression Estimates on Monthly Total Returns of Mortgage REITs

| Variable | Variable Definition | Model 1M | | Model 2M | | Model 3M | | Model 4M | |
|--|--|---------------|--------|------------------------|---------------|-----------------------|---------------|------------------------|----------------|
| I. Dependent Variable: Mortgage REITs | | | | | | | | | |
| C | Intercept | 0.007 | (0.73) | 0.003 | (0.47) | -0.008 | (-0.84) | -0.041 | (-2.56) |
| RMBS_T | Total Return on MBS Index | 1.102 | (0.94) | | | 2.033 | (2.10) | <i>1.711</i> | <i>(1.79)</i> |
| ERM | Excess Return on the Stock Market | | | 0.627 | (3.64) | 0.736 | (4.27) | 0.792 | (4.51) |
| SMB | Small minus Big Stock Return | | | 0.521 | (3.11) | 0.529 | (3.29) | 0.580 | (3.78) |
| HML | High minus Low Book-to-market Stock Return | | | 0.852 | (3.66) | 0.897 | (4.00) | 0.845 | (3.95) |
| CPYSP | Corporate Bond Credit Spread | | | | | | | 0.903 | (2.94) |
| TRM21 | Lag 1 Squared Total Return on Mortgage REITs | | | | | | | -0.277 | (-0.25) |
| Adjusted R ² / F-test | | 1.837% / 1.76 | | 21.312% / 6.17 | | 27.278% / 9.91 | | 33.456% / 8.88 | |
| II. Dependent Variable: Residential Mortgage REITs | | | | | | | | | |
| C | Intercept | 0.006 | (0.58) | 0.006 | (0.69) | -0.007 | (-0.73) | -0.044 | (-2.66) |
| RMBS_T | Total Return on Residential MBS Index | 1.438 | (1.24) | | | 2.214 | (2.20) | <i>1.931</i> | <i>(1.89)</i> |
| ERM | Excess Return on the Stock Market | | | 0.474 | (2.52) | 0.593 | (3.21) | 0.651 | (3.48) |
| SMB | Small minus Big Stock Return | | | 0.510 | (2.81) | 0.519 | (2.88) | 0.602 | (3.55) |
| HML | High minus Low Book-to-market Stock Return | | | 0.657 | (2.69) | 0.706 | (3.07) | 0.648 | (2.94) |
| CPYSP | Corporate Bond Credit Spread | | | | | | | 0.956 | (2.77) |
| TRMH21 | Lag 1 Squared Total Return on Residential Mortgage REITs | | | | | | | 0.109 | (0.09) |
| Adjusted R ² / F-test | | 2.789% / 2.70 | | 15.161% / 5.48 | | 17.863% / 6.17 | | 24.462% / 6.07 | |
| III. Dependent Variable: Commercial Mortgage REITs | | | | | | | | | |
| C | Intercept | 0.010 | (1.07) | 0.000 | (-0.03) | -0.006 | (-0.72) | -0.036 | (-2.31) |
| CMI_T | Total Return on Investment-grade CMBS Index | 0.552 | (0.73) | | | 1.035 | (1.55) | 0.784 | (1.20) |
| ERM | Excess Return on the Stock Market | | | 0.912 | (5.57) | 0.995 | (5.64) | 1.054 | (5.64) |
| SMB | Small minus Big Stock Return | | | 0.583 | (3.37) | 0.576 | (3.62) | 0.585 | (3.44) |
| HML | High minus Low Book-to-market Stock Return | | | 1.236 | (5.27) | 1.240 | (5.59) | 1.231 | (5.42) |
| CPYSP | Corporate Bond Credit Spread | | | | | | | 0.757 | (2.42) |
| TRMC21 | Lag 1 Squared Total Return on Commercial Mortgage REITs | | | | | | | 0.151 | (0.42) |
| Adjusted R ² / F-test | | 0.136%/1.13 | | 37.508% / 20.00 | | 40.922% (17.45) | | 43.188% / 12.91 | |

The t-statistics in parentheses are computed using White's heteroskedasticity-consistent variance-covariance estimator. **Bold** -- Significant at 5%; **Bold and Italic** -- Significant at 10%

3. Conclusions and Implications

Although mortgage REITs are investing in mortgages and/or MBS, this study shows that returns on MREITs and the underlying MBS market indices exhibit

completely different return and risk characteristics. In addition, MREITs are much more strongly driven by the stock market systematic factors than the underlying MBS market factors. The results are remarkably robust using either daily or monthly data, full sample or subsample data, and residential or commercial MREITs data. At first glance, these results seem to indicate that the markets for MREITs are inefficient in reflecting the underlying MBS market performance. However, we believe that further research is needed to address this puzzle about the disconnection between the returns on MREITs and the underlying MBS market.

MREITs, like all real estate investment trusts, are publically traded stocks. The features associated with stocks, such as margin trading, short selling and intraday quoting, make the MREITs much more liquid than the over-the-counter traded MBS and more sensitive to stock market volatility and changes in investor sentiment. An interesting question to ask, is whether such sensitivity is justified by the underlying asset value and if not, whether the presence of such inefficiency leads to any profitable arbitrage opportunity.

In addition, the Barcap MBS indices used in this study may not fully reflect the performance of each mortgage REIT's underlying mortgage and/or MBS portfolio. The Barcap residential MBS index only covers agency residential MBS, and the Barcap home equity ABS index only includes investment-grade home equity ABS.

Finally, many MREITs might be holding more whole loans than the securitized mortgages in the form of RMBS or CMBS. If the monthly net asset value (NAV) of individual MREITs is made available, future research should directly test the efficiency of the MREIT market using the monthly closing price on MREITs and their respective NAVs.

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