Performance of Real Estate Investments and Spillover Effect of Financial Markets 2000-2009

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Abstract

We examine how private real estate investments and Real Estate Investment Trusts (REITs) performed versus other investments after many high tech firms collapsed in the early 2000s until 2009. Primarily, we test if volatility in financial markets has a spillover effect on real estate. Our findings suggest that the US REITs maintain the highest average rate of return and the lowest risk/reward ratio. We show that there is a clear volatility spillover effect from equity and high yield bonds on real estate. Commodity and real estate are relatively independent and there is no significant inter-market influence/spillover between them.

Keywords, "spillover volatility effect", "GARCH", "vector autoregressive," "REIT S&P", and" real estate performance."

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The primary reasons that investors may add real estate to an existing portfolio are to enhance yield, to hedge against inflation, and to diversify their portfolio. After the burst of the high technology sector across the global market in the early 2000s, there was a significant shift towards investment in real estate; both through private real estate investments and Real Estate Investment Trusts (REITs.) In this paper, we first explore how private real estate investments and REITs performed versus other possible investments following the financial crisis from 2000 to 2009. Second, we measure the amount of volatility in financial markets with a spillover effect on the private real estate investment and REITs. The motivation behind this inquiry is to verify if there was a significant inter-market linkage during 2000 to 2009 that may suggest the need for extra prudence in portfolio management in the periods of rising volatility.

We organize this paper into three sections. In section 1, we offer a background and review of selected literature of volatility spillovers. Section 2 describes the methodology and analyzes the computed statistics. We present a summary and conclusion of our findings in section 3.

1. Background and Literature Review

Measuring the performance of the private real estate investment is not feasible without using appropriate classification. The US National Council of Real Estate Investment Fiduciaries (NCREIF) is an industry organization providing indexes for direct real estate investments. Their main objective is to compile data, calculate the indexes, and disseminate information to facilitate research in the area of real estate. Industry and academic fields commonly use the NPI (the NCREIF Property Index) for such research. The index estimates the current market value of its included properties to be close to $300 billion. These NPI properties involve six main categories of real estate investments: offices, apartments, retail centers, shopping malls, warehouse and manufacturing properties, and accommodation centers (i.e. hotels.) Offices and apartments constitute the biggest portion of the index, totaling approximately 60% of all properties, NCREIF (2009.)

A major limitation of the NPI is that it computes the average prices and periodic returns based on appraised values, rather than actual transactions in the market. Also, though we expect the appraised NPI index to base its estimates quarterly, in practice they report a good portion of the index property values on an annual basis. To alleviate this limitation, we use an unsmoothed NPI index that normalizes and corrects appraised prices for the market value. Fisher, et al (2003) detailed a methodology on the un-smoothing processes to normalize the appraised prices.

Unlike private real estate investments, the index computation for REITs is easier and more reliable. Since REITs are readily available for trade, REIT data is far more accessible and their comparative performance, adjusted for risk, more manageable. Complexity may arise, however, in the choice of REITs for research. In terms of structure, a REIT could be a single property REIT, a finite life REIT, a dedicated REIT investing in a single development, or an umbrella partnership REIT. Depending on which type of REIT we use, the research results could be different. Fortunately, the US REIT corporate structure requires all American REITs to satisfy four criteria. They must i) act as a corporation, ii) trade like an exchange traded fund iii) have a trustee as the manager rather than a financial institution and iv) have at least 100 owners with no significant concentration in ownership. Therefore, REITs are more homogenous, in terms of corporate financial and legal structure, than actual real estate private investments. This relative homogeneity of US REITs makes comparative performance of REITs more reliable than those of direct real estate investments.

Data reports by Anson (2009) show that the average return on private real estate investments in the US, which we measure by the composite index for a 10 year period of 1990 to 1999, has a range of -5.59% to 16.25%. The volatility, defined by standard deviations in that period, is highest for the office buildings and lowest for apartments. By contrast, the Sharpe ratio is highest for apartments.

Academic and industry research shows volatility from one sector of the market does influence (spill over) other sectors over long and/or short periods. The exact magnitude of the volatility spillover effect, regardless of the duration of the period, and possible explanations are still a matter of debate among researchers and policy makers. Understanding the size of and the reason for the inter-market volatility effect is important because of its implications for investments and corporate real estate decision making (i.e. investment returns, capital budgeting, and optimal asset allocations.)

Lee and Stevenson (2005) empirically demonstrated the persistence of an inter-market volatility (the spillover effect) for different categories of REITs. Their results are consistent with an earlier study on the spillover effect by Stevenson (2002.) Cotter and Stevenson (2005) also supported that there is a linkage among real estate sub-sectors and equity indexes. They justified their findings in the context of an optimal portfolio and demand by investors for more diversification. Wilson and Zurbrugg (2002 and 2003) reported that despite limited research in this area the results on inter-market integration were mixed. Yet, they showed that the property markets of certain regions had a possible integration towards the leading economies of the US, Japan and the UK.

The spillover effect, namely the impact of volatility from one market on the other, goes back to general studies in capital markets and is, by no means, unique to real estate. Researchers examine commodities, foreign exchanges, and the global market for possible inter-market volatility effect. Among a number of

empirical studies conducted on the inter-market volatility spillover effect is an investigation by Baele (2005,) who extended the same concept to an international setting and showed the inter-temporal nature of volatility spillovers from the national European and US markets to selected local markets in Europe. Michaylauk, Wilson, and Zurbruegg (2006) examined the changing information flow of securitized real estate investments between the NYSE and the London Stock Exchange. They showed that there is an interaction between the two markets if "synchronized price data" are utilized. In a recent study, Bond and Hatch (2010) used Granger casualty tests and reported a preliminary finding that the trading activity of real estate ETFs influences the volatility of REITs.

Expanding on the existing literature, we examine the performance of various real estate investments and selected equity, high yield bonds, and commodity indexes from the year 2000 to the end of 2009. Beginning in 2006, the economy and, in particular, real estate showed signs of a recession. We explore whether, within the same period, there was an inter-market volatility spillover effect among selected sectors of real estate, equity, high yield fixed income, and commodities in the US market.

2. Methodology and Data Analysis

2a. Selected Indexes, Vector Autoregressive and GARCH

The indexes we use to measure the performance of different sectors are the S&P REIT index, the NPI Adjusted (unsmoothed) index, the Russell 1000 (representative of large cap stocks,) the Russell 2000 (representative of smaller caps,) the Dow Jones AIG Commodity Index, and the Salomon Smith Barney High Yield Bonds. The sources of data are the Bloomberg database and the historical database of the National Council of Real Estate Investment Fiduciaries. We have 10 years of quarterly data and a total of 120 observations for each index. We use arithmetic rates of return for returns and compute the historical standard deviation for the purpose of volatility. Because using the risk-free may distort the computation of Sharpe ratio, we use the coefficient of variation (the ratio of standard deviation to return) as a proxy for risk/reward in place of the Sharpe ratio.

For the purpose of determining if volatility from one sector affects the others, we use a set of vector autoregressive equations formulated as follows:

$$Y_t = a_1 + b_1 (Y_t\text{-}1) + k_1(X_t\text{-}1) + e_1 \quad (1)$$

$$X_t = a_2 + b_2 (X_t\text{-}1) + k_2 (Y_t\text{-}1) + e_2. \quad (2)$$

In this model, $\mathbf{Y_t}$ is a real estate index return, $\mathbf{X_t}$ is the index return of another sector, **a** is a constant value, **b** is the coefficient for the dependent variable, **k** is the coefficient for the independent variable, and **e** is the error term.

Next, to determine the magnitude of the spillover effect, we also use a GARCH (1,1) model. GARCH (1,1) is a methodology established in empirical literature where the conditional variance becomes a dependent variable of its preceding values, presented as follows:

$$Y_t = c + p\ Y_t\text{-}1 + e_t \quad (3)$$

$$h_t = a_0 + a_1\ (e_t\text{-}1)^2 + b1(h_t\text{-}1) + s(j_t\text{-}1)^2. \quad (4)$$

In the above GARCH set of equations $\mathbf{Y_t}$ is a real estate index return, $\mathbf{Y_t\text{-}1}$ is the real estate index return from a previous period, and $\mathbf{e_t}$ is the error term (noise.) The value of $\mathbf{h_t}$ is the conditional variance. Note that the value of **s** is the volatility spillover effect (coefficient,) measuring any significant spillover over time (Enders 2003.)

2b. Comparing Performance: Risk and Return

Table I indicates that over a 10 year period from 2000 to 2009, the REITs of S&P Index outperformed many other investments: such as the real estate private investment (NPI), the S&P equity index, the high yield bonds index (Salomon Smith Barney), and the commodity index (Goldman Sachs Commodity Index Total Return.) Adjusted for risk, which we measure by the coefficient of variation, the real estate private investment NPI and the REITs S&P maintained the lowest ratio of risk to return. For example, while the commodity market exposed an investor to approximately three units of risk for every unit of return, his or her counterpart in US real estate had a risk/reward ratio of 1.50 to 1.75 during the same study period.

In terms of volatility, Table I shows that investing in commodity was most risky, with a standard deviation of 29.29%. The real estate private investment NPI had the least volatility, but we should interpret the result with caution because we base the NPI index on quarterly and annual appraisals, not actual transactions. The S&P Equity index, in terms of volatility, maintained the lowest standard deviation of 17.68% among the listed investments. Yet, when we adjust the index for both risk and return, the S&P equity produced the inferior ratio (-22.7%) in that period. Stated otherwise, investors earned a negative return (-.779%) while bearing a relatively high degree of risk at 17.68%. The corresponding ratios of risk to return for investing in the US REITs S&P were 13.041% and 22.861, respectively. Even when the data of the real estate recession of 2007 to present are included, these numbers are more favorable.

2c. Volatility Spillover Effects

There is a clear indication from Tables II and III that when we use the NPI index, we do not detect any significant spillover effect from equity, high yield bonds, or commodity to private real estate investments. Despite its popularity, the NPI index is an appraised value and may not help identify the possibility of the inter-sector volatility influence. The REIT's S&P index, however, shows the spillover effect from equity, high yield bonds, and commodity to real estate to be consistently significant at 5% level of confidence (Table II.) This observation is important because it reveals when volatility rises in other sectors of the US market it affects the REIT market. In our study, we used a one-quarter lag for all spillover effects from other sectors to the REIT's S&P.

The vector autoregressive results of Table II are also consistent with the GARCH statistics of Tables III and IV. Again, while the NPI index does not help identify the spillover effect, we clearly see that the value of S (the spillover effect) in the GARCH model is statistically significant at 1% for both the equity and high yield bonds market. Even when using the REITs S&P, we do not see a significant spillover effect from the commodity market to the real estate market. A possible explanation for the absence of significant volatility effect between the commodity and real estate market is that the commodity market has its own idiosyncratic characteristics where prices are merely determined by supply, demand, and events in nature.

3. Summary and Conclusions

Following the collapse of many high tech firms in the early 2000s, a significant amount of capital and resources shifted towards investment in different sectors of real estate, including private investments in the six large categories of properties included in the NPI. At the same time, demand for passive forms of investments in various types of REITs grew exponentially.

In this paper, we address two interrelated questions. First, how different types of real estate investments perform as compared to equity, commodity, and high yield bonds. Second, as uncertainty and volatility rises, we examine if there is any volatility spillover effect from other sectors of the market to the real estate market. We present the period of 2000 to 2009 because, in that specific decade, we observe several huge shocks in the capital and real estate markets. In the early part the 2000s, the unexpected burst of technology firms and massive US corporate bankruptcies hit the global market. Then, beginning in 2006, the market volatility spiked as many financial institutions faced credit and liquidly crises. In 2008, the VIX fear factor of the Chicago Board of Trade reached unprecedented levels of 80 to 90 and, at times, even approached the most alarming level of 100.

Using the Bloomberg Database, we extract quarterly observations for the period of 2000 to 2009 for a set of representative indexes, as outlined in section II. We also use vector autoregressive equations along with the GARCH model to measure the possibility of volatility spillover effect from other market sectors to the real estate market.

We find that, despite well-known problems in the real estate market after 2006, investment in REITs S&P maintained the highest rate of return and a lower risk/reward ratio (as measured by the coefficient of variation) in the period of 2000 to 2009. There was a clear volatility spillover effect from equity and high yield bonds to investment in REITs in the US market. In contrast, the real estate and commodity markets were relatively independent from 2000 to 2009. There was no significant inter-market influence between them.

The existence of a spillover effect among real estate, equity, and high yield fixed income has implications for hedging risk and constructing optimal investment portfolios. Managers and CEOs should be extra cautious and prepare viable contingent financial exit strategies in periods of rising volatility. For future research, we recommend further inquiry into volatility spillover effect among different financial markets and real assets, including real estate investments in domestic and international markets, in periods of rising volatility.

Table I
Performance of the US Real Estate Investments, Equity, High Yield Bonds and Commodity : 2000-2009

	Real Estate Private Investment NPI %	Real Estate Investment Trust S&P %	S&P 500 Equity %	High Yield Bonds%	Goldman Sacks Commodity Index Total Return%
2000	13.29	27.97	-9.92	-4.41	49.74
2001	1.57	13.82	-9.69	6.92	-31.93
2002	6.07	4.12	-22.5	-0.58	32.07
2003	11.88	34.77	22	29.36	20.72
2004	21.21	30.98	7.01	10.51	17.28
2005	26.2	11.18	8.36	2.07	25.55
2006	13.14	35.03	9.66	11.72	-15.09
2007	15.05	-16.21	4.16	1.91	32.67
2008	-16.1	-37.95	-36.54	-24.68	-46.49
2009	-7.33	26.7	19.67	52.71	13.48
Return	**8.498**	**13.041**	**-0.779**	**8.553**	**9.8**
Volatility	**12.837**	**22.861**	**17.686**	**19.599**	**29.292**
Coefficient of Variation	**1.51**	**1.75**	**-22.7**	**2.291**	**2.98**

Table II
Spillover Effect from Equity, High Yield Bonds and Commodities to Real Estate Investment Trust S&P Index (REITs S&P)

Inter-market Spillover	Coefficient	T-value
S&P Equity to NPI	0.7654	1.65
High Yield Bonds to NPI	-0.97654	1.02
Commodity to NPI	-0.541	0.896
S&P Equity to REITs	0.975	3.879**
High Yield Bonds to REITs	0.432	3.23**
Commodity to REITs	0.879	3.65**

The "t" values marked with ** are significant at 5%. Note that none of the t-values associated with NPV index are significant. A plausible explanation is that the NPI index is an appraised value index, not based on actual transactions.

Table III
Summary Statistics Results of the GARCH Model for Spillover Effect from Equity, High Yield Bonds, and Commodities to Real Estate Private Investment NPI

GARCH Coefficients	From Equity to NPI	From High Yield Bonds to NPI	From Commodity to NPI
Constant term C	.0032 p= .113	.0002 p=.135	.00119 p=. 084*
a_0	.4321 p=.086*	.257 p=.0656*	.4372 p=.0743*
a_1	.4685 p=.154	.4527 p=.156	.0533 p=.123
b_1	.0051 p=.1468	.0032 p=.1324	.00643 p=.0988*
S (spillover effect)	.4566 p=.089*	.4276 p=.1543	.1234 p=.1789

Note: The "p" values marked with * are significant at 10%. None of the above numbers are significant more than 10%. A plausible explanation is that the NPI index is an appraised value index, not based on actual transactions.

Table IV
Spillover Effect from Equity, High Yield Bonds and Commodities to Real Estate Investment Trust S&P Index (REITs S&P)

GARCH Coefficients	From Equity to REITs S&P	From High Yield Bonds to REITs S&P	From Commodity to REITs &SP
Constant term C	.0026 p=.043**	.0031 p=.0135***	.02118 p=. 1142
a_0	.7321 p=.046**	.257 p=.0056***	.6371 p=.0831*
a_1	.6682 p=.0174***	.9521 p=.0126***	.8532 p=.1923
b_1	.0063 p=.0146***	.0985 p=.0024***	.02743 p=.11781
S (spillover effect)	.8566 p=.019***	.00164 p=.044***	.35342 p=.1589

Note: The "p" values marked with *, **, *** asterisks are significant at 10%, 5%, and 1% respectively. Except for the case of commodity to REITs S&P, the GARCH coefficients for other inter-market spillover effects are significant either at 1% or 5%.

References

Anson, M., 2009, *An Introduction to Core Topics in Alternative Investments* (Wiley & Sons, Inc., New York.)

Baele, L., 2005, "Volatility spillover effects in European equity markets," *Journal of Financial and Quantitative Analysis,* 2 (2,) 373-401.

Bond, S. and Hatch B., 2010, "Did Leveraged ETFs Increase Intraday REIT Volatility During the Crisis?" 46th Annual AREUEA Conference scheduled for January 2011, Denver, Colorado, paper abstract at http://ssrn.com/abstract.

Cotter, J. and Stevenson, S., 2006, "Multivariate Modeling of Daily REIT Volatility," *Journal of Real Estate Finance and Economics*, 32, (3,) 305-325.

Ender, W., 2003, *Applied Econometrics Time Series* (John Wiley and Sons, Inc., New York.)

Fisher, J, et al., 2003, "Controlling for the impact of variable liquidity in commercial real estate price indexes," *Real Estate Economics* 31, (2,) 283-304.

Lee, S. and Stevenson, S., 2005, The suitability of REITs and value stocks, working paper, Center for Real Estate Research, University of Readings.

Michaylauk, D., Wilson, P. and Zurbruegg, R., 2006, "Asymmetric Volatility, Correlation, and Return Dynamics Between US & UK Securitized Real Estate Markets," *Real Estate Economics,* 34, (1,) 109-131.

National Council of Real Estate Investment Fiduciaries database, 2009, www.ncreif.com.

Stevenson, S., 2002, An examination of volatility spillover in REIT return, *Journal of Real Estate Portfolio Management* 8, 229-238.

Wilson, P., Zurbruegg, R., 2002, "Structural Breaks, Diversification and International Real Estate Markets – Some New Evidence," *Briefing in Real Estate Finance*, 1 (4), 348-366.

Wilson, P., Zurbruegg, R., 2003, "International Diversification of Real Assets – Is it worth it?" Working Paper N0. 126, School of Finance and Economics, University of Technology Sydney.