International Research Journal of Applied Finance ISSN 2229 – 6891
Vol. X Issue – 3 March, 2019 www.irjaf.com

Is the performance of the REIT dominated by Stock Market and Mortgage Interest Rates?

Kuo-Hao Lee* **Wei-Chih Chiang** **Jonathan Ohn** **Even Eryilmaz**

Abstract

The objective of this study is to examine the causal relationships among the behaviors of REIT, S&P 500 and the mortgage fixed interest rate. The Granger causality test is applied here by use of a leveraged bootstrap test developed by Hacker and Hatemi-J (2006) to monitor the causalities. The result indicates that the change rate of the mortgage fixed interest rate causes significant movement of the S&P 500 index return and the REIT index return. Further, the stock market is driven by the movement of the return of the REIT index. Our finding provides a new vision that needs to be taken into consideration while building an investment portfolio.

Keywords: Granger Causality, Bootstrap, REIT, S&P 500, Real Estate Market

I. Introduction

A real estate investment trust (REIT) is a company that owns income-producing real estate which include many types of commercial real estate, ranging from office and apartment buildings to warehouses, hospitals, shopping centers, hotels and timberlands. Unlike other public companies, at least 90% of REIT's taxable earnings must be distributed as dividends to shareholders. Investors can trade shares of REITs just like stocks, bonds or any other type of security. Since REITs is considered to be the easiest way for investor to profit from commercial real estate, REITs have become more and more popular investments in recent years.

Some people argue that since commercial real estate values normally lag those of residential real estate, REIT values are comparatively low correlation with the rest of the market, makes them an excellent portfolio diversifier that can help reduce risk. Further, REITs bring competitive total returns, based on high and steady dividend income. However, the performance of the REITs follows more than just the real estate values, it also depends on the demand for REITs themselves as an investment, which means REITs compete with other investment such as stocks and bonds. Therefore, the share price of REIT could fall in a stock market crash even the value of the real estate owned by the REIT rises.

Through June 30, 2014, REIT funds, as tracked by Morningstar Inc., had a category average gain of 16.6%, which compares with 7.1% for the S&P 500 Index. That's a big swing from 2013 when the S&P gained 32% and REIT funds rose just 1.6%. REIT funds are also averaging 3.7% dividend yields, nearly double the S&P's 2% in June 2014. It is a difficult decision for investors to choose from the REITs or the stock market for both long-term and short-term investment. Numerous studies of the relationship within the stock market and the REITs are made but the link between these two major investments still has not been unanimous.

Prior research has found that the performance of the real estate index has impact on the stock market. Su, C. (2011) found the existence of long-run unidirectional and bidirectional causality between the real estate market and the stock market in Western European countries. Tsai, M. and Chiang, S. (2013) studied the relationship of real estate investment trusts (REITs) and stock, and discovered that there has been long-term equilibrium in REIT and stock indices in most of Asia markets they monitored. Subrahmanyam, A. (2007) tested the first exploration of liquidity and order flow spillovers across New York Stock Exchange stocks and real estate investment trusts (REITs) and his result showed evidence that returns in the stock market negatively forecast REIT order flows. Lean, H. and Smyth, R. (2012) examined the dynamic linkages between real estate investment trusts (REITs), interest rates and stock prices in Malaysia over the period 2006 to 2009 and found the result suggested that the housing market will lead the stock market.

Some research, on the other hand, found no significant impact of the real estate market on the stock market. Aman, U. and Zhong-guo, Z. (2003) found that there is no significant impact of the sales of homes on the stock returns directly. Ling, D., Naranjo, A. and Ryngaert, M (2000) revealed that excess equity REIT returns are far less predictable out-of-sample than in-sample. This inability to forecast out-of-sample is particularly true in the 1990s.

Since REITs have to pay out 90% of their profits to the investors, which makes REITs relatively high-yield instruments which can makes REIT to be sensitivity to interest rate changes. But how are the REITs affected by the mortgage fixed interest rate? Current literature investigates the relationship between the mortgage fixed interest rate and the real estate markets. Ito. T, (2013) analyzed the impact of stock prices and interest rates on the REITs market in Japan. The samples of financial stress events included the collapse of Lehman Brothers and the fiscal crisis in the euro zone. The data results showed evidence that a positive impact on the stock prices was larger and a negative impact of interest rates was larger. However, contrary to previous research, Glascock, J., Lu, C. and So, R. (2000) results showed that REITs behave more like stocks and less like bonds after the structural changes in the early 1990s.

In this research, we will examine the causality among the return of the REIT index and S&P 500 index the change rate of the mortgage interest rate to provide the investors another prospect to evaluate the investment portfolios.

II. Data and Methodology

This study employs monthly data of the REIT index and S&P 500 index return and the 30 Year fixed interest rate are collected during the sample period: from January 1975 to October 2014.

First, the return of the REIT index and S&P 500 index, also the change rate of the mortgage interest rate are calculated by the following formula:

$$x_t = \frac{(p_{t+1} - p_t)}{p_t}$$

The summary statistics of the change rates is showed in Table 1.

Next step, the Granger causality are studied by the use of a leveraged bootstrap test developed by Hacker and Hatemi-J (2006). The following vector autoregressive model of order p, VAR (p) is applied:

$$x_t = \upsilon + A_1 x_{t-1} + \cdots + A_p x_{t-p} + e_t \,,$$

where x is a two dimensional vector from two factors. The lag order p is selected as Hatemi-J(2003, 2008, 2011) recommended the following information criterion that is robust to ARCH effects:

$HJC = \ln\left(det\widehat{\Omega}_j\right) + j\left(\frac{n^2 lnT + 2n^2 \ln(lnT)}{2T}\right), j = 0, \dots, p.$

where $det\widehat{\Omega}_j$ is the determinant of the estimated maximum likelihood variance-covariance matrix of the residuals in the VAR(j) model, where n is the amount of the variables and T is the sample size.

The null hypothesis that *k*th element of σ_t does not Granger-cause the *d*th element of x_t is defined as

H_0: the row *d*, column *k* element in $A_r$equals 0 for $r = 1, \dots, p$.

A Wald test is implanted here to test the null hypothesis. First, we reformulate the VAR(p) model as:

$$Y = DZ + \varepsilon$$

Then, the null hypothesis of non-Granger causality can be expressed as

$$H_0: C\beta = 0$$

This null hypothesis will be tested via the following Wald test statistics:
$Wald = (C\beta)'[C((Z'Z)^{-1} \otimes S_U)C']^{-1}(C\beta) \sim \chi_p^2,$

where $\beta = vec(D)$ and vec is the column-stacking operator; the notation $\otimes$ represents the Kronecker product and C is a $(p \times n)(1 + p \times n)$ indicator matrix. S_U represents the variance-covariance matrix of the unrestricted VAR model. That is, $S_U = (\hat{\varepsilon}'_U \hat{\varepsilon}_U)/(T - c)$, where c is the number of estimated parameters.

Since most of the financial market data is commonly considered to be non-normality and with time-varying volatilities in which case, the Wald test based on asymptotic critical values would lose the accuracy. In this study, we applied a causality test method developed by Hacker and Hatemi-J (2006) to ensure that the test is robust to non-normality as well as time-varying volatility. The following steps are taken:

I. Estimate the VAR model above and obtain the estimated residuals ($\hat{e}_t$).

II. Next, generate the simulated data, denoted by x_t^*, as following:

$$ax_t^* = \hat{A}_0 + \hat{A}_1 x_{t-1} + \cdots + \hat{A}_p x_{t-p} + \hat{e}_t^*$$

These adjusted residuals are computed to make sure that the mean will be zero. Addition, the regressions' raw residuals are modified by using *leverages* as suggested by Hacker and Hatemi-J (2006) in order to have constant variance.

III. Repeating the process 10, 000 times and compute a bootstrap simulation and the *W* test statistic is calculated thereafter each simulation. Then the α-level of significant "bootstrap critical values" (c_α^*) can be obtained. The simulations are conducted by using the module written in Gauss by Hacker and Hatemi-J (2009a) which is available online.

IV. Lastly, draw conclusion by comparison of the calculated W statistic of the original simulated data with the bootstrap critical values c_α^*. If the calculated W statistics is higher than the critical values, reject the null hypothesis of non-Granger causality at the α-level of significance, which means that the data support a existence of Granger causality between the two variables that we examine.

III. Empirical Results

A bootstrap simulation is applied in this research that doesn't require normality and the result in Table 2. The calculated W statistics is 19.079 for the causality of the change rate of 30 year fixed mortgage interest rates on the return of the REIT index, which is greater than all three estimated critical values at 1%, 5% and 10% levels. This result suggest that the null hypothesis is rejected that the performance of the mortgage interest rate does have effect on the REIT return at 1% of significant level.

In contrast, the calculated W statistic for the causal effect of the return of the REIT index on the change rate of the 30 year fixed mortgage interest rate is 2.652, which is lower than each estimated critical values, which implied we fail to reject the null hypothesis. There is no significant evidence to support that there exist the effect of the REIT on the mortgage interest rate. This data result reveals only a uni-direction causality existed between the return of the REIT index and the 30Y FRM. Further, significant impact is found on the return of the S&P 500 index by both the return of the REIT index and the change rate of the 30 year fixed mortgage interest rate. However, no evidence is found that the return of the S&P 500 interest rate affects the return of the REIT index nor the change rate of the 30 year fixed mortgage interest rate.

IV. Conclusions

Investors excessively fear potential interest rate increases when investing in REITs due to their above average yield, this conception might cause them to loss the chance to benefit from it. Are REITs really so risky? Or put it another way, are REITs riskier than the other stock, such as S&P 500? This question becomes more and more popular. It is important to reveal the mystery relationship among the returns of the index of REITs and S&P 500 and the 30 year fixed mortgage interest rate. A Granger causality test is applied in this research, by use of a leveraged bootstrap test developed by Hacker and Hatemi-J (2006) which doesn't require normality, to examine the causality among the REIT return, S&P500 index return and the 30 year fixed interest rate during sample period from January, 1975 to October, 2014.

According to the result of the causality, the 30 year fixed interest rate causes significant movement in both the returns of REIT and S&P 500 index. One downside of REITs for investors is that as a high-yield investment, a REIT can be exposed to interest rate changes. The test result also reveal that the stock market is driven by the performance of REIT index. This finding provides am innovative approach to analyzing and solving the mystery relationships of the REITs with stock market and the interest rate.

Table 1: Summary Statistics

Descriptive Statistics	30Y FRM	REIT index Return	S&P 500 Index Return
Average	-0.1233	1.1345	0.8058
Standard deviation	3.1382	4.9961	4.3537
Minimum	-13.1363	-30.2258	-21.7630
Maximum	17.1779	30.8128	13.1767

Table 2: The results of causality test using the leveraged bootstrap test

Null hypothesis	Calculated W-statistics	bootstrap critical value		
		1%	5%	10%
30Y FRM ⇏ REIT return	***19.079**	9.137	6.135	4.675
REIT return ⇏ 30Y FRM	2.652	9.443	6.145	4.664
REIT return ⇏ S&P500 return	***8.318**	6.663	3.776	2.631
S&P500 return ⇏ REIT return	1.223	6.871	3.769	2.722
S&P500 return ⇏ 30Y FRM	1.103	9.362	5.984	4.594
30Y FRM ⇏ S&P500 return	***18.901**	9.631	6.160	4.691

Notes:
(i) 30Y FRM ⇏ REIT return denoted as 30Y FRM change rate does not cause the REIT index return.
(ii) * indicated that the null hypothesis is rejected at 1%.

References

Aman, U., & Zhong-guo, Z. (2003). Real estate and stock returns: a multivariate VAREC model. *Property Management*, *21*(1), 8.

Glascock, J., Lu, C., & So, R. (2000). Further Evidence on the Integration of REIT, Bond, and Stock Returns. *The Journal of Real Estate Finance and Economics*, *20*(2), 177-194. doi: 10.1023/A:1007877321475

Hacker, R. S., & Hatemi-J, A. (2003). Is the J-curve effect observable for small North European economies? *Open economies review*, *14*(2), 119-134.

Hacker, R. S., & Hatemi-J, A. (2006). Tests for causality between integrated variables using asymptotic and bootstrap distributions: theory and application. *Applied Economics*, *38*(13), 1489-1500.

Hatemi-J, A., & Irandoust, M. (2011). The dynamic interaction between volatility and returns in the US stock market using leveraged bootstrap simulations. *Research in International Business and Finance*, *25*(3), 329-334.

Hatemi-J, A., & S. Hacker, R. (2009). Can the LR test be helpful in choosing the optimal lag order in the VAR model when information criteria suggest different lag orders? *Applied Economics*, *41*(9), 1121-1125.

Hooi Hooi, L., & Smyth, R. (2012). REITS, INTEREST RATES AND STOCK PRICES IN MALAYSIA. *International Journal of Business & Society*, *13*(1), 49-62.

Ling, D. C., Naranjo, A., & Ryngaert, M. D. (2000). The predictability of equity REIT returns: time variation and economic significance. *The Journal of Real Estate Finance and Economics*, *20*(2), 117-136.

Scott Hacker, R., & Hatemi-J, A. (2008). Optimal lag-length choice in stable and unstable VAR models under situations of homoscedasticity and ARCH. *Journal of Applied Statistics*, *35*(6), 601-615.

Su, C.-W. (2011). Non-linear causality between the stock and real estate markets of Western European countries: Evidence from rank tests. *Economic Modelling*, *28*, 845-851. doi: 10.1016/j.econmod.2010.10.021

Subrahmanyam, A. (2007). Liquidity, Return and Order-Flow Linkages Between REITs and the Stock Market. *Real Estate Economics*, *35*(3), 383-408. doi: 10.1111/j.1540-6229.2007.00194.x

Takayasu, I. (2013). The Impact of Stock Price and Interest Rate on the REIT Market in Japan. *International Journal of Business*, *18*(4), 359.

Tsai, M.-S., & Chiang, S.-L. (2013). The asymmetric price adjustment between REIT and stock markets in Asia-Pacific markets. *Economic Modelling*, *32*, 91-99. doi: 10.1016/j.econmod.2012.12.013

Ullah, A., & Zhou, Z. g. (2003). Real estate and stock returns: a multivariate VAREC model. *Property Management*, *21*(1), 8-24. doi:10.1108/02637470310464463

Author

Kuo-Hao Lee*
Department of Finance, College of Business, Bloomsburg University of Pennsylvania, Bloomsburg, PA17815, klee@bloomu.edu

Wei-Chih Chiang
School of Business Administration, University of Houston- Victoria

Jonathan Ohn
Department of Finance, College of Business, Bloomsburg University of Pennsylvania

Even Eryilmaz
Management Information Systems, College of Business, California State University-Sacramento, USA

*corresponding author