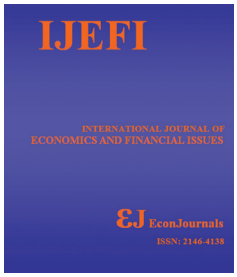

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Portfolio Diversification Benefits Using Real Estate Investment Trusts – An Experiment with US Common Stocks, Equity Real Estate Investment Trusts, and Mortgage Real Estate Investment Trusts

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ABSTRACT

Using recent data (2002-2012) from the US financial markets, we study the magnitude and benefits of Real Estate Investment Trust (REIT) and common stock in portfolio diversification. In particular, we examine the effects of risk-reduction benefits through diversifying among common stocks via Equity REITs (EREITs) and Mortgage REITs (MREITs). In addition, overall performance measures are calculated and compared among REIT, common stock and mixed-asset portfolios. We observe that investors can benefit from diversification using EREITs but not MREITs. In fact, MREITs turn out to be the worst asset class to be in diversifying portfolio. This conclusion is in contrast with Kuhle (1987) who claims improvement of portfolio risk reduction with MREITs. Our finding, however, is consistent with Hartzell et al. (1986) and Chen et al. (2005). Finally, even though our data period consists one of the historic collapses of real estate market in the US, it still indicates the EREITs still offers diversification benefits. It provides evidence that small investors can use EREITs to diversify their risks. It also offers an opportunity to earn return on real estate investments without investing in real estate properties which may be beyond investor's capacity.

Keywords: Portfolio Diversification, Risk, Equity Real Estate Investment Trusts, Mortgage Real Estate Investment Trusts
JEL Classifications: D53, G11, R30

1. INTRODUCTION

Financial engineering and securitization have made the financial market endowed with large numbers of financial instruments for the investor to consider both at retail and institutional levels. In addition to common stocks and stock mutual funds, now investors have an array of alternative securities such as Exchange Traded Funds, Equity Real Estate Investment Trusts (EREITs) and Mortgage REITs (MREITs) to trade and invest. Nowadays, investors can include real estate based investments in their portfolio allocation along with stock portfolio to diversify their portfolio risk. With this increased "securitization" of real estate markets beginning from early 1980s, the application of traditional portfolio theory has become potentially more viable. Existing research findings indicate that risk reduction is possible with portfolio holdings of REITs with stocks (Kuhle, 1987; Grissom et al., 1987; Chen et al., 2005; among others). Global financial crisis in 2007-08 that has noted a historic turmoil in financial markets around the world especially with the bubble burst in the housing sector makes us curious if the potential of the mortgage and real estate related assets' role in portfolio risk reduction is still in place. The purpose of this research, hence, is to investigate with recent data whether the diversification benefit in reducing risks exists in portfolio formation with stocks and the two types of REITs. Literature seems to be very little regarding the role of REITs in risk management and we intend to fill this gap in the current literature considering different REITs of US. This research examines the effects of diversification on the reduction of total

portfolio risk combining three asset classes namely, Common Stock Portfolio, EREITs and MREITs. We examine the effect of risk on portfolio diversification with each asset class separately and with mixed asset portfolios to understand the power of these REITs in risk reduction. A full set of Markowitz (1952) analysis is employed to examine the risk and return potential of portfolios comprised of REITs only and REITs combined with common stocks. The level of risk is calculated to determine if significant differences exist between the various classified common stock and REITs portfolios. The overall performance of portfolios is calculated by a return/risk ratio and then those various ratios are tested for each portfolio category to determine if pairwise significant difference exists.

2. LITERATURE REVIEW

Chen et al. (2011) find that EREITs return are sensitive to changes in monetary policy across/with different EREITs return. During bull markets, changes in monetary policy have a significant negative impact on EREITs when investors have lower expectations of real estate price increases, but are not effective when investors have higher expectations of real estate price increases. To the contrary, during volatile and bear markets, EREITs return are not sensitive to changes in monetary policy stance. Results also show that EREITs return respond positively to stock returns in various states and conditions. Schmidt (2004) investigates risk return characteristics and diversification benefits when private equity is used as a portfolio component. Schmidt finds that private equity outperforms stock investment. He observes that high average portfolio returns are generated solely by the ability to select a few extremely well performing companies. He observes that there is a high marginal diversifiable risk reduction of about 80% when the portfolio size is increased to include 15 investments. He also observes that an actual average portfolio size between 20 and 28 investments seems to be well balance selection for the purpose of investment. Chen et al. (2005) investigate whether investors can improve their investment opportunity sets by adding a REIT portfolio to benchmark portfolios. They find that EREITs appear to be non-redundant financial assets, which helps to enhance the completeness/competence of the financial market. MREITs provide no diversification benefits in the sample period. Georgiev et al. (2003) find that real estate investment represents a significant part of many institutional portfolios as the benefits increase with real estate investments as part of an investor's overall asset portfolio. Alcock et al. (2013) investigate whether REIT managers actively manipulate performance measures in spite of the strict regulation under a REIT regime. Their findings suggest that the existing REIT regulation may fail to mitigate a substantial agency conflict and investors benefit from evaluating return information carefully in order to avoid potentially manipulative funds. Fei et al. (2010) examine the dynamics of the correlation and volatility of REITs, stocks, and direct real estate returns. They find a strong relationship between correlations and REIT returns and that the patterns are distinguishable for different types of REITs. Interestingly, when the correlation between REITs and the Standard and Poor's 500 (S and P 500) is at its lowest, the future performance of REITs is at its highest. Results suggest that it has economic implications regarding the time-dependent diversification benefits of REITs in a mixed-asset portfolio and the unique risk and return characteristics of REITs. Lee (2014) demonstrates his analysis of the volatility spillovers and asymmetry between REITs and stock prices for nine countries (Australia, Belgium, Germany, Italy, Japan, The Netherlands, Singapore, the United Kingdom, and the United States) using eight different multivariate generalized autoregressive conditional heteroskedasticity models utilizing the optimal weights, hedging effectiveness, and hedge ratios for REIT-stock portfolio holdings. Horrigan et al. (2009) using REIT return data, bond data, and property holding data, construct property market segment-specific indices of asset returns. They show that pure-play indices can be employed to make pure, targeted investments in the commercial real estate market while retaining the liquidity, transparency, and pricing efficiency benefits of the well-developed public market in REITs. Francis and Ibbotson (2009) study the annual returns of US real estate over the 31-year period starting in 1978. They find that EREITs substantially outperform physical real estate over the sample period, and MREITs and hybrid REITs suffered badly from the subprime mortgage crisis. Fisher and Goetzman (2005) examine actual cash flows from commercial properties over 1977-2004 and provide insight into the benefits of diversification by property sector versus location. Kaiser (2005) observes that private real estate returns cannot be explained adequately by alpha and beta alone. Lee and Kien (2009) studies on the Malaysian securitized real estate market and find that property shares offer little diversification benefits or portfolio return enhancement, whereas the equally weighted REITs portfolio does provide some diversification benefits and return enhancements under the mean-variance and downside risk frameworks. The results also reveal that the equally and value-weighted REIT portfolios do behave differently. Garcia-Feijoo et al. (2012) evaluate the effectiveness of several asset classes in the hedging of portfolio risk over the 1970-2010 period. Of the alternative assets examined, commodities offer the greatest diversification potential due to their very low correlation with stock and bond returns. Furthermore, while the diversification benefits of many asset classes diminish during periods of extreme market movements, the benefits of commodities remain strong. Overall, they find robust support for the hedging potential of commodities. Grissom et al. (1987) show that significant diversification benefits can be obtained by using real estate assets along with common stocks to create well-diversified portfolios. Kuhle (1987) examines the effects of diversification on the reduction of total portfolio risk in REITs and mixed-asset portfolios. When overall performance measures are calculated and compared among REITs, common stock, and mixed-asset portfolios, he observes that the improvement of portfolio risk reduction with MREITs. Kuhle (1987) further maintains that risk reduction takes place with common stock and EREITs portfolio. This risk reduction and performance analysis also support that EREITs, not MREITs combined with common stock offers efficient portfolio, in a Markowitz sense, than of only common stocks. In our research we focus closely the findings of Kuhle (1987). Using different and more recent time periods, we examine whether the risk reduction findings are similar or whether recent phenomena offer different results. Our results confirm some of the findings of Kuhle (1987), differ on others (Hartzel et al., 1986, Burns and Epley, 1982, Clayton et al. 2009,

and Chen et.al., 2005) and lend support to the findings of Chen et al. (2005).

3. THE DATA AND METHODOLOGY

The sample for this research consists of ex post prices and dividends for a total of 82 firms -26 EREITs, 16 MREITs, and 42 common stocks listed on various stock exchanges. REITs are classified as either EREITs or MREITs by the percentage of each REIT's total assets invested in equity asset ownership or mortgage asset ownership. Any REIT that is not clearly (60% or more) invested in the equity or mortgage position is excluded from the sample. The 42 common stocks used are randomly selected from the S and P 500 that are most expensive and large common stocks. It is designed that way to make a comparable sample for REITs as REITs are combinations of various assets. The time period chosen for the research is from July 2002 through July 2012. We could not review the earlier period as many of the REITs do not have enough time series data. Earliest time is chosen to be July 2002 due to the availability of data for all securities. All firms included in the sample had their monthly returns calculated using:

$$R_i = [(P_i - P_{io}) + D_i] / P_{io} \quad (1)$$

Where, R_i = monthly return for asset i, where, i = 1,2,…,42 in case of common stock, i = 1,2,…,26 in case of EREITs, and i = 1,2,…,16 in case of MREITs. P_{i1} = asset price at the end of the month, P_{i0} = asset price at the beginning of the month, D_{i1} = dividend paid at the end of the month for asset i. The monthly return values are then used to create portfolio of various size within five portfolio categories: (i) EREITs, (ii) MREITs, (iii) common stock portfolios, (iv) Mixed portfolios of EREITs and common stock, and (v) mixed portfolios of MREITs and common stock. Return of the portfolio is estimated as follows:

$$R_P = \sum_{i=1}^{N} x_i R_i \quad (2)$$

Where, x_i = proportion of total portfolio invested in security i, and i=1,2,…,N. There are "N" number of securities in the portfolio where, N = 2,3,…12 with R_i has the meaning of Equation (1). Within each category a total of 600 portfolios are created containing various levels of assets. That is, 50 random portfolios are created that contained 1,2,…,12 assets each. Each asset in each portfolio is equally weighed, therefore, no attempt is made to solve for optimal asset proportions and or minimum variance asset allocations. Once returns are estimated, the standard deviation for each of the randomly created portfolios is calculated from:

$$\sigma_p = \sqrt{\sum_{i=1}^{n}\sum_{j=1}^{n} x_i x_j \sigma_{ij}} \quad (3)$$

Where, σ_p = portfolio standard deviation, x_i = proportion of total portfolio invested in security i, x_j = proportion of total portfolio invested in security j, σ_{ij} = correlation between securities i and j, n = total number of securities in the portfolio.

The portfolios are calculated on the basis of equal asset proportions; therefore $x_i = x_j$. Equally weighed assets usually result in the highest portfolio risk. But the rationale for equal weights is that the investor has no information about the future information on returns and variances or covariance. Therefore, if we can show reduced risk level on any combination, we expect that this result should hold for similar experiment on minimum variance portfolio risk reduction and optimal portfolio risk reduction as well. Once these portfolio risks are estimated, an average of the risk is calculated and used for our experiment via,

$$\bar{\sigma}_P = \frac{\sum_{i=1}^{50} \sigma_{Pi}}{50} \quad (4)$$

3.1. Research Hypotheses and Test Criteria

Four general research hypotheses are tested in this research:

1. The portfolio risk level for EREITs and MREITs portfolios is not significantly lower than the risk level for common stock portfolios
2. The risk level for mixed REIT and common stock portfolios is not significantly lower than the risk level for common stock portfolios
3. The reward/risk level for EREITs and MREITs portfolios, measured by the ratio of returns to standard deviations, is significantly greater than the reward/risk level of common stock portfolios
4. The reward/risk level for mixed REIT and common stock portfolios is significantly greater than the reward/risk level of common stock portfolios.

The Z-test is used to determine the statistical difference between various portfolio categories for each hypothesis. A 95% confidence level is selected in calculating the critical Z-value of 1.64. Equation (4) is used in determining the calculated Z-value for each portfolio comparison made.

$$Z = \frac{X_1 - X_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \quad (5)$$

Hence, any calculated Z > 1.64 would indicate a significant statistical difference in the two means tested. For example, consider hypotheses one. The Z-test would measure the statistical difference between EREITs or MREITs and common stock portfolios with asset levels ranging from 1 to 16.

Finally, as we all know that standard deviation is not a perfect measure of risk and sometimes difficult to compare among assets, a modified version of Sharp ratio is designed to offer the performance test. In Sharp ratio, we measure the risk to reward ratio by taking the difference of the return with respect to the risk free asset and then divide that by the risk. In this analysis, we drop the risk free rate in order to find the ratio of return over risk. It is estimated as follows for each type of portfolios:

$$S = \frac{\bar{R}_P}{\bar{\sigma}_P} \quad (6)$$

Where, $\bar{R}_P$ and $\bar{\sigma}_P$ are the average of the 50 portfolio values, and S is the modified Sharp ratio. We drop the risk free ratio as it is not constant and fixed either as we have seen in last two decades. In late 1990s, risk free rate has been as high as 6.5% and then it has dropped to as little as 0.25% in early 2000s and still it is that low. However, it is left for future research to investigate whether the results we draw can have any impact if we incorporate dynamic risk free rate.

4. RESULTS AND ANALYSIS

Table 1 presents summary statistics of all three categories of securities risk and returns. In our descriptive statistics, we observe that common stocks offer an average monthly return of 1.45% with 9.25% standard deviation. During the same time period, EREITs offer an average return of 0.65% with 10.20% standard deviation. Finally, MREITs offer an average of.8% return with 16.08% standard deviation. It is very interesting to note that during the period of July 2002 to July 2012, randomly chosen 52 common stocks perform better than two categories of REITs and it gives rise to the question whether portfolio mix of common stock with two types of REITs would offer better risk adjusted return.

4.1. Differences in Portfolio Risk Levels: Non-Mixed-Asset Portfolios

The effects of diversification on risk in portfolio setting are first analyzed for our hypothesis 1 for non-mixed-asset portfolio case. Exhibit 1 shows the amount of portfolio risk level for 5 different asset classes for various combination portfolios. Each of the number in the exhibit is an average of the risk of 50 random portfolios for that class. The result of the monthly risk level is calculated by taking average of risk from 50 portfolio created randomly out of available securities in class. For example, a three-stock common stock portfolio's risk number shown in the exhibit is an average of the 50 three-stock common stock portfolio's risks. Once using variance of the portfolio of three stocks are calculated and repeated for 50 times using random selection with equal weights, we then take square root of the variances to find standard deviation and then averaged on 50 portfolios. Portfolios are created using a range of one asset to 16 assets from the same class of assets. As it is observed, common stocks portfolio does exhibit lower risk level than MREITs and EREITs. For example, a 7 stock portfolio has 6.03% portfolio risk, whereas, a 7 EREITs portfolio has a risk level of 6.55% and that of MREITs of 9.48%. It is not surprising as during the chosen period there has been a collapse in mortgage and real estate markets in the US. It is also observed from this exhibit that mix of common stock and EREITs do show an improvement in risk reduction as opposed to the mix of common stock and MREITs. For example, a 12 asset combination of common stock and EREITs has a standard deviation of 5.15% compared to 6.39% for a 12 asset common stocks and MREITs portfolio. The mixture of common stock and EREITs also show an improvement in risk reduction compared to common stock only. From the combination of five assets portfolio and onward, Mix of common stock and EREITs exhibits lower trending risk than common stock only portfolios.

Our results show that as we increase number of stocks in portfolios, risk level on average is reduced in each of the five asset classes. Notable result is the risk level of MREITs which is substantially higher compared to other asset classes. EREITs follow that of

Table 1: Descriptive statistics of randomly chosen 52 common stocks, 36 EREITs, and 16 MREITs

Return	Common stocks			EREITs			MREITs		
standard	Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum
Return	0.014476	−0.00385	0.04379	0.00065	−0.00547	0.01947	0.00798	−0.00375	0.0748
STD	0.0926	0.04839	0.16222	0.10195	0.04664	0.27149	0.16079	0.05835	0.74738

EREITS: Equity Real Estate Investment Trusts, MREITs: Mortgage Real Estate Investment Trusts

Exhibit 1: Average portfolio risk levels (monthly standard deviations) for the five portfolio categories

Number of assests in portfolio	Common stocks	EREITs	MREITs	EREITs+common stocks	MREITs+common stocks
1	0.09014449	0.09356149	0.11667340	0.11286919	0.19480562
2	0.07339119	0.09875972	0.12989906	0.07501094	0.09600176
3	0.06800259	0.08090223	0.11934539	0.06097817	0.08373499
4	0.06369339	0.07137199	0.10542039	0.06660787	0.09100867
5	0.05987907	0.06766036	0.11868970	0.05763449	0.09255665
6	0.06015175	0.07164919	0.09445273	0.05494328	0.06620053
7	0.06029581	0.06554437	0.09479827	0.05368553	0.07737244
8	0.05927917	0.06976110	0.08968564	0.05214839	0.06826420
9	0.05573255	0.06310134	0.09738588	0.05150260	0.07027697
10	0.05638244	0.06506779	0.09020443	0.05181440	0.06717805
11	0.05680601	0.06341733	0.08763746	0.05129149	0.06229943
12	0.05556790	0.06507813	0.08719880	0.05154605	0.06385254
13	0.05517407	0.06320726	0.08147692	0.04990176	0.06637302
14	0.05477303	0.06404460	0.08409202	0.04942903	0.05876460
15	0.05389162	0.06292353	0.08321987	0.04829395	0.06345760
16	0.05522372	0.06021358	0.08066065	0.04769629	0.05687532

EREITS: Equity Real Estate Investment Trusts, MREITs: Mortgage Real Estate Investment Trusts

MREITs which is also not surprising as our sample is taken from one of the historic housing bubble period of 2002-2012. With the collapse of housing and mortgage markets, it is no surprise that during this time periods, larger common stocks performed much better than REITs of both categories. One more interesting observation is the combination of common stock with EREITs. Column five shows the five-asset portfolio risks from both. Common stock with EREITs portfolio risk (0.05763449) tends to reduce more than common stock portfolio risk (0.05987907) with five asset combination portfolios. It is also true when compared with MREITs plus common stock. One clear distinction that we claim is the process of calculation. We differ from Kuhle (1987) in calculating portfolios of mix asset with REITs. Kuhle (1987) uses 11 stocks and an EREITs to calculate one asset portfolio of EREITs and common stock, whereas, we estimate the same portfolio by taking one asset from each class of assets. Similar process is used in calculating portfolios for the other mix assets as well. However, the findings from the results seem to match with Kuhle (1987) that mix of EREITs with common stock compares better than MREITs with common stock.

Exhibit 2 summarizes the Z-score results for the test between mean standard deviation values of common stock and those of EREITs and MREITs portfolios. It is a test of findings for the non-mixed assets. Among the three asset classes, we explore if any of them has better risk reduction than the others. Here, we take the standard deviation numbers of each asset class from Exhibit 1 in order to perform the test. Respective numbers are taken from the asset class based on how many assets are included in portfolio. For example, the test result in column 2 row 5 (2.71575487) is calculated by taking the difference of the risks of five-assets portfolio of common stock and five asset portfolio of EREITs to apply in the numerator of Equation (3). The denominator numbers are estimated from the 50 random five asset respective portfolio's variance (variance of variances). We know that at the alpha level of 0.05, the hypothesis should be rejected if the Z-score registers above 1.64. The calculated Z-scores as shown in Exhibit 2 are all higher than 1.64. The implication, under the assumptions of normal distribution, is that the risk level of MREITs is higher than EREITs and common stock portfolio.

Also, the risk level of EREITs is higher than the common stock portfolio. This result though counter intuitive and yet not surprising given the sample period. This result suggests that investors would be better off avoiding MREITs from their portfolio and select common stock and some EREITs to form a balanced portfolio.

4.2. Differences in Performance Ratios: Mixed-Asset Portfolios

Exhibit 3 displays the Z-score results for mixed-asset portfolios. These results establish our view that MREITs are highly volatile asset class compared to EREITs. Investors can benefit from combination of common stock and EREITs portfolio rather than common stock only portfolio for all assets combination except for one asset portfolio. When common stock and MREITs are combined, it is observed that diversification does not benefit investors until eight-assets portfolio. Diversification does not benefit at all when compared with common stock with EREITs and common stock with MREITs as all the Z-score values are smaller than 1.64 except for two cases.

We should point out that the results in column 2 of Exhibit 3 are for common stock with EREITs versus common stocks not *viz*. and same is the case for results in column 3. In these two columns we test the significance of mix with common stock against common stock portfolio itself. Findings are clearly suggesting benefits combination of common stock and EREITs but not with MREITs. The second part of the finding contradicts with Kuhle (1987). The last column shows the result of significance of common stock

Exhibit 2: Average Z-scores between various non-mixed-asset portfolio categories difference between mean monthly standard deviations

Number of assets in portfolio	Common stocks versus EREITs	Common stocks versus MREITs	EREITs versus MREITs
1	0.56800657	1.77085102	1.51984764
2	4.43831032	3.93243520	2.05352401
3	3.28615878	4.65085292	3.37415643
4	2.76434831	5.18225472	4.10769487
5	2.71575487	8.36080526	6.90001559
6	4.16589432	5.98253160	3.71206815
7	2.76485872	7.15673339	5.85971120
8	4.82407450	7.70412623	4.66931598
9	3.57376355	13.71966429	9.89186833
10	4.68241623	12.30765604	8.28304276
11	4.53010235	12.69960262	9.33035145
12	6.47391904	15.14892826	9.83636239
13	5.75019643	13.13993652	8.47542836
14	6.61760848	25.04792097	12.89681895
15	6.91176194	37.77628744	17.95119063
16	4.66495266	47.03467420	22.15614786

EREITS: Equity Real Estate Investment Trusts, MREITs: Mortgage Real Estate Investment Trusts

Exhibit 3: Average Z-scores between various mixed-asset portfolio categories difference between mean monthly standard deviations

Number of assets in portfolio	Common stocks versus common stocks+EREITs	Common stocks versus common stocks+MREITs	Common stocks+EREITs versus common stocks+MREITs
1	1.32055680	0.83280702	0.81928427
2	2.19261615	1.70830324	0.70669137
3	3.16201448	2.30256933	0.98856683
4	2.83194895	1.27442314	1.24866467
5	3.25995246	1.08984681	1.54432022
6	3.16715222	2.28372518	0.50942484
7	3.69666475	1.45380887	1.53291614
8	4.31703378	2.42264666	1.46565664
9	4.00369641	2.25765071	1.04573445
10	3.86017586	2.12492258	1.64687867
11	4.55835964	3.09730367	0.32385152
12	3.78231793	2.55405097	1.03073348
13	4.23594553	2.57735337	1.53153228
14	4.22618967	2.67665448	1.45713216
15	4.50369398	2.82299999	1.77069694
16	4.70907239	3.19210051	1.28207471

EREITS: Equity Real Estate Investment Trusts, MREITs: Mortgage Real Estate Investment Trusts

plus MREITs against common stock with EREITs and it is clear that MREITs combination does not add value for the investors in terms of risk reduction.

4.3. Differences in Performance Ratios: Non-Mixed-Asset Portfolios

In previous section, we present the empirical test results for the difference between the risk levels of various portfolio categories for hypothesis one and two. It is clear that if we rank the assets based on lowest risk to highest risk, common stock portfolio comes first and MREITs portfolio comes last. As it is well known that the standard deviation is not a perfect measure of risk and sometimes difficult to compare among assets, in this section first we combine the risk and return based performance and then compare the three assets classes. A modified version of Sharpe ratio is designed to offer the performance test. In Sharp ratio, we measure the risk to reward ratio by taking the difference of the return with respect to the risk free asset and then divide that by the risk. In this analysis, we drop the risk free rate in order to find the ratio of return over risk. To give details of our process, we first estimate return and risk for each combination. Then we generate 50 returns and 50 risks for that combination. Once we find them, we then take average of those numbers to generate return and risk to find their ratios. This process is followed for each of the asset combination for all 16 portfolio cases.

Exhibit 4 provides results for three non-mixed-asset categories portfolios' performance ratios. It is calculated by first using modified version of the Sharp ratio to calculate performance ratio of each category and then using Z-score for the performance comparison. The modified performance ratio expresses, as discussed, the return of a portfolio in relation to its risk or standard deviation. It represents the magnitude of financial rewards per unit of risk. If the performance ratio is high, it is an indication of higher performing asset overall. The return/risk ratio is calculated for each of the random 50 portfolios of each asset class. Then average of the 50 portfolio for each class and each size such as $1,2,...,16$ assets is calculated. These samples are then used for statistical test of significance between various categories of portfolios. Not surprisingly, common stock only portfolio performed better than both EREITs and MREITs. EREITs also did better than MREITs. Results shown in the Exhibit 4 are clearly suggesting that mean performance ratio of the stock portfolio is superior to both EREITs and MREITs. The results also show the EREITs also outperformed MREITs.

4.4. Differences in Performance Ratios: Mixed-Asset Portfolios

Exhibit 5 compares the Z-scores of common stock portfolios with mixed portfolios of common stock and EREITs, common stock portfolio with mixed portfolios of common stock and MREITs, and mixed portfolios of common stock and EREITs with mixed portfolios of common stock and MREITs. Results, again, are similar to those found in Exhibit 4. Common stock portfolio stands out to be superior to any mix. Column 2 and 3 are holding results for that conclusion. Investors can expect enhanced portfolio performance holding as many common stocks in their portfolio than holding some EREITs and common stock or MREITs and common stock. Results in column 4 is also supporting similar conclusion found in Exhibit 4. The mix of common stock and EREITs is superior to mix of common stock and MREITs. These results confirm the economic reality of the mortgage market during the housing bubble that has crashed financial wealth of investors in this category in last decade.

Exhibit 4: Average Z-scores between various non-mixed-asset portfolio categories difference between mean performance ratios

Number of assets in portfolio	EREITs versus common stocks	MREITs versus common stocks	MREITs versus EREITs
1	7.09652683	6.74776028	4.61594833
2	11.06299866	8.25681180	3.23341050
3	13.74437055	9.62745547	3.51013559
4	16.62581708	11.41446708	4.00079918
5	15.66057221	11.82171331	4.62450437
6	16.70428561	13.62723156	5.39018621
7	19.43666915	14.23729134	5.19151610
8	19.64240521	16.42395331	5.44517137
9	19.99948777	17.69512101	4.27148573
10	20.51948246	18.35208229	5.30128618
11	23.64619845	20.15944166	6.01356775
12	23.35042485	21.02361189	5.74488026
13	23.74297746	21.68352774	6.94597552
14	23.38778016	25.90721990	4.97652494
15	24.79149757	34.04536670	6.66570497
16	26.55459523	45.41948480	9.51508553

EREITS: Equity Real Estate Investment Trusts, MREITs: Mortgage Real Estate Investment Trusts

Exhibit 5: Average Z-scores between various mixed-asset portfolio categories difference between mean performance ratios

Number of assets in portfolio	Common stocks versus common Stocks+EREITs	Common stocks versus common stocks+MREITs	Common stocks+EREITs versus common stocks+MREITs
1	9.07751202	4.23255758	1.53230286
2	12.03141551	9.71401348	4.38914595
3	20.93132870	14.97127573	7.20713193
4	25.77629936	12.40216268	3.17980448
5	29.40209353	13.40779006	4.94182801
6	23.82387699	18.32240435	7.86804125
7	31.22869817	12.93883175	4.37514806
8	46.36014185	23.21988804	5.87562933
9	45.07938062	23.87665116	9.02739894
10	41.25271343	24.96014712	7.16103237
11	57.43116537	34.70421513	11.75217759
12	38.18776231	31.50654629	13.17056818
13	46.93220641	35.73779176	14.74642483
14	44.41166877	30.53029763	9.69134152
15	53.65612257	40.99688629	14.17102562
16	44.54012873	36.46092594	14.75235812

EREITS: Equity Real Estate Investment Trusts, MREITs: Mortgage Real Estate Investment Trusts

5. CONCLUSIONS

The main purpose of the research is to explore the role of two types of REITs in portfolio choice to determine if it helps in diversifying

risk enough to include in individual investor's portfolio holdings. The secondary objective is to examine the overall performance between various classes of common stock and REITs portfolios. The conclusion to our first objective is that MREITs seem to be out of class and too risky compared to EREITs. Investors can benefit from diversification using EREITs. Our observation, however, has research time period that could be biased as it included in the analysis one of the decades when there are two collapses around the world especially in the United States, namely, housing bubble burst and systemic financial collapse. At this time, MREITs turn out to be the worst asset class to be in diversifying portfolio. This conclusion is in contrast of Kuhle (1987) who claims improvement of portfolio risk reduction with MREITs, and is consistent with Hartzell et al. (1986). Like Kuhle (1987), however, we also observe that risk reduction takes place with common stock and EREITs portfolio. This risk reduction and performance analysis also support EREITs in contrast to MREITs combined with common stock offers efficient portfolio, in a Markowitz sense, than of only common stocks. Finally, even though our data period consists one of the historic collapse of real estate market, it is indicative that the EREITs continue to offer diversification benefits. It would be interesting to test this model with new data on different countries to further expand the knowledge in this field during those two major shocks during (2002-2012) which may or may not have affected directly or indirectly to those countries. It provides evidence that small investors can use ERIETs to diversify their risks. It also offers an opportunity to earn return on real estate investments without investing in real estate properties which may be beyond investor's capacity. REITs as alternative investments in property instead of buying home should be a future topic of research focus.

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