

The Role of REIT Preferred and Common Stock in Diversified Portfolios

By Walter I. Boudry, Jan A. deRoos, and Andrey D. Ukhov

EXECUTIVE SUMMARY

While “maximizing returns” is a stated goal of many investors, it is clear that some are more willing than others to embrace risk in their pursuit of those returns. An analysis of risk-return profiles finds that investors see different purposes for real estate investment trust (REIT) common stock and preferred stock depending on their tolerance for risk. Using a utility-based approach and imposing realistic constraints on the investor’s portfolio, this report shows that REIT preferred and common stock provide diversification benefits, but to different sets of investors. Risk tolerant investors find REIT common stock beneficial, while risk averse investors find the preferred stock more favorable. The key highlight from the study is that investors, especially those who have investment grade bonds, should consider adding REIT preferred stock to their portfolios.

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People planning for retirement must eventually decide how much of their savings to put in stocks, bonds, or other assets. This report sheds some light on the diversification benefits of the real estate investment trust (REIT) market. There are two primary reasons for exploring this issue. First, little is known about the risk-return characteristics of REIT preferred stock. This is a significant omission, because preferred stock constitutes 20 percent of all the public equity that REITs issue.¹ Second, using standard mean-variance tools, studies show that investors with well diversified portfolios receive little benefit from access to REIT common stock. Our research examines whether this is also true for REIT preferred stock.

¹ <http://www.reit.com/DataAndResearch/REIT-Capital-Offerings/Detailed-Data.aspx>.

REIT security issuances (\$millions)

Year	Debt	IPO	Preferred	Seasoned
1992	310	693	46	808
1993	2,348	8,485	666	2,609
1994	3,173	6,714	155	3,337
1995	3,324	827	1,678	4,727
1996	4,327	1,108	1,550	8,561
1997	9,785	4,776	4,795	19,381
1998	13,941	1,269	4,879	12,006
1999	9,555	292	2,150	1,966
2000	6,045	—	365	1,171
2001	8,650	—	679	1,769
2002	8,353	517	1,067	3,342
2003	9,958	2,325	4,905	4,484
2004	16,956	4,581	4,822	6,698
2005	15,515	1,726	2,735	6,805
2006	24,322	1,824	3,751	13,554
2007	15,765	737	2,998	7,243
2008	4,343	—	947	7,492
2009	10,193	633	—	18,172
2010	18,444	1,987	1,631	18,742
2011	13,525	1,766	4,108	14,782
2012	19,400	1,049	8,466	23,815
Total	218,229	41,309	52,390	181,463
% of Total	44%	8%	11%	37%

Notes. The figures above are the U.S. dollar amounts of securities issued by U.S. REITs each year, expressed in millions of dollars.

The methodology employed in this study is the same as that described in a recent article we prepared for *Real Estate Economics*.² While the full derivation and analytics can be found in that paper, the intuition behind their framework is straightforward. In the standard mean-variance realm introduced by Markowitz, investors are unconstrained in their portfolio formation and may borrow at the risk-free rate.³ In this framework, all investors hold the same collection of risky assets and adjust their allocation to the risk-free asset based on their risk preferences. This can be seen in the standard mean-variance frontier in Exhibit 2. All optimal portfolios lie on the red line, and all portfolios on the red line are a combination of the tangency portfolio and the

risk-free asset. The slope of the red line is determined by the Sharpe ratio, and any asset that increases the Sharpe ratio helps all investors.⁴ If an asset that is part of the tangency portfolio helps improve the slope of the red line (increases the Sharpe ratio), it is valuable to all investors regardless of risk preferences.

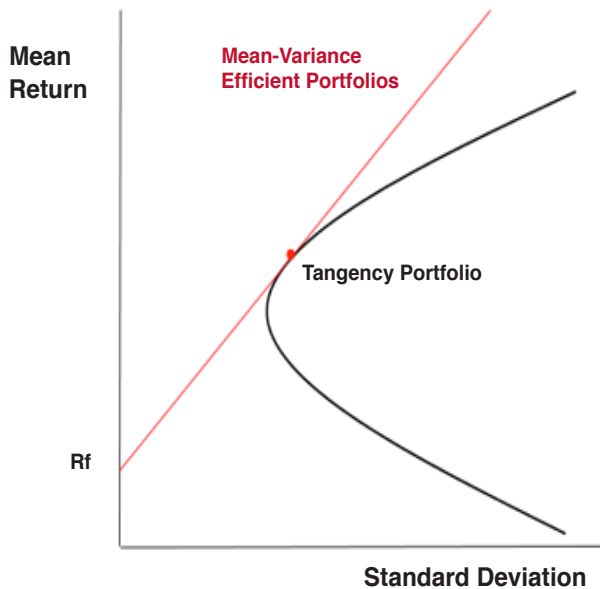
Among the assumptions behind the standard mean-variance setting is that the investors have no limitations in forming their portfolios. This means that the investors can short any asset in any amount. They can also borrow any amount needed to finance this investment at the same rate as the U.S. government. In practice, both of these assumptions are unlikely to be true. While some assets can be shorted, it is typically costly to do so, and no investor can borrow money as cheaply as the govern-

² Boudry, W.I., J.A. deRoos, and A.D.Ukhov. 2016. "Diversification Benefits of REIT Preferred and Common Stock: New Evidence from a Utility based Framework." *Real Estate Economics*, forthcoming.

³ Markowitz, H.M. 1952. Portfolio Selection. *Journal of Finance* 7: pp. 77-91.

⁴ The Sharpe ratio indicates the average return minus the risk-free return divided by the standard deviation of return on an investment. See: William F. Sharpe (1966). "Mutual Fund Performance." *Journal of Business* 39 (S1): pp. 119-138.

Classical mean-variance frontier



Notes. The horizontal axis is the portfolio standard deviation (or risk) and the vertical axis is the annual portfolio return. The parabola traces the maximum return possible at each level of risk. The red line shows the maximum return at each level of risk using a set of stylized, unrealistic assumptions.

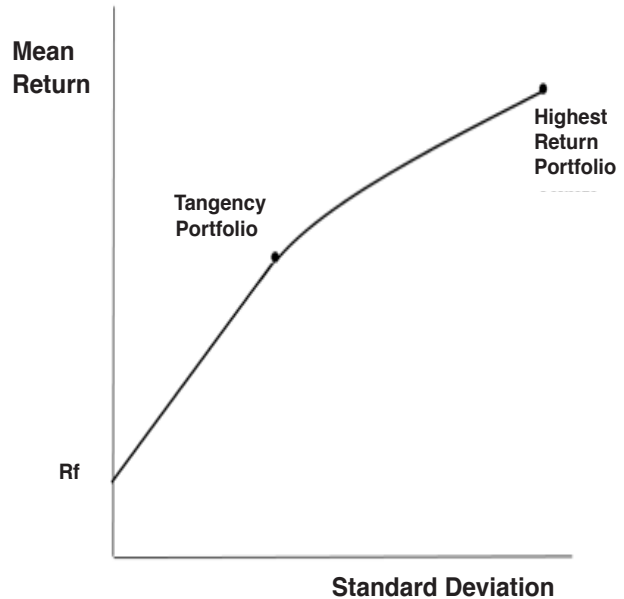
ment. We show that when short sales and borrowing constraints are imposed on the investor's portfolio, the results from the standard mean-variance setting regarding diversification no longer hold.⁵

Analyzing the investor's constrained portfolio problem, we show that imposing short sales and borrowing restrictions on the investor leads to a new efficient frontier, as seen in Exhibit 3.⁶ The frontier is no longer represented by a straight line; rather it now has segments (from the risk free rate [rf], to the tangency portfolio, tangency portfolio to the highest return portfolio, and the highest return portfolio itself). There are two key points to note about these segments. First, the risky assets that constitute each segment are different. This means that optimal portfolios in different parts of the frontier have different risky assets. Second, investors with different levels of risk aversion will invest in different segments on the frontier. Combining these two points results in the following outcome: investors with different levels of risk aversion will hold different portfolios of risky assets. Thus, we can no longer define diversification benefits in the aggregate using summary measures such as Sharpe ratios. When considering the diversification benefits of various assets, it is important to identify the risk preferences of the investor.

⁵ Boudry *et al.*, 2016.

⁶ *Ibid.*

Constrained mean-variance frontier



Notes. The horizontal axis is the portfolio standard deviation (or risk) and the vertical axis is the annual portfolio return. The line shows the maximum return at each level of risk using a constrained (realistic) investment environment.

Data

In considering the diversification benefits of REITs, a well done study should allow investors to have a large menu of securities in which to invest. To create this list we collected monthly returns for 13 indices for the period November 1992 to November 2012. From Datastream we obtained returns on the Barclays Investment Grade Corporate Bond Index, the Barclays High Yield Corporate Bond Index, the MSCI World Ex-US index, the Russell 2000 index, the Russell 2000 growth index, the Russell 2000 value index, the Russell Mid Cap index, the Russell Mid Cap growth index, and the Russell Mid Cap value index. We obtained the SNL US Equity REIT index from SNL Financial. From MSCI we obtained the MSCI REIT Preferred Index, and from CRSP we obtained returns on the 30-day T-bill and the returns on the S&P500. As a result, our investor has access to international stocks, U.S. large-, mid-, and small-cap stocks, value and growth portfolios, and high yield and investment grade bonds in addition to the REIT common and preferred indices.

All of the indices used in the analysis are standard, apart from the MSCI REIT Preferred Index. The terms of the preferred stock issued by REITs are standardized. REIT preferred stock has a fixed dividend rate, is typically issued at par, and is callable after five years. Preferred stock has priority to common

EXHIBIT 4

Return and correlation percentages

	Pref	REIT	World Ex-US	SP500	MidCap	MidCap Growth	MidCap Value	Rus2000	Rus2000 Growth	Rus2000 Value	IG Bonds	HY Bonds
Panel A: Annualized Mean and Standard Deviation												
Mean	10.26	12.89	7.85	9.20	11.47	10.75	11.80	10.35	9.10	11.46	7.06	8.33
Std	11.35	20.11	16.95	15.10	16.84	21.34	16.02	19.62	23.26	17.40	5.55	8.98
Panel B: Correlation												
Pref	100.00	62.50	39.63	38.49	46.54	34.18	52.10	41.67	33.69	49.50	53.89	67.62
REIT	62.50	100.00	54.37	55.99	65.36	46.84	74.61	64.96	52.04	77.30	30.73	60.85
World Ex-US	39.63	54.37	100.00	81.51	81.94	75.13	77.31	74.51	71.55	71.88	28.63	62.84
SP500	38.49	55.99	81.51	100.00	92.50	85.46	88.12	80.92	77.98	78.95	26.60	61.84
MidCap	46.54	65.36	81.94	92.50	100.00	92.81	93.31	93.05	89.43	89.89	28.00	68.03
MidCap Growth	34.18	46.84	75.13	85.46	92.81	100.00	73.77	90.34	94.58	75.67	20.56	60.11
MidCap Value	52.10	74.61	77.31	88.12	93.31	73.77	100.00	82.19	71.68	90.94	30.63	66.03
Rus2000	41.67	64.96	74.51	80.92	93.05	90.34	82.19	100.00	97.18	93.81	19.16	62.78
Rus2000g	33.69	52.04	71.55	77.98	89.43	94.58	71.68	97.18	100.00	83.24	15.59	58.77
Rus2000v	49.50	77.30	71.88	78.95	89.89	75.67	90.94	93.81	83.24	100.00	22.10	62.95
IG Bonds	53.89	30.73	28.63	26.60	28.00	20.56	30.63	19.16	15.59	22.10	100.00	54.13
HY Bonds	67.62	60.85	62.84	61.84	68.03	60.11	66.03	62.78	58.77	62.95	54.13	100.00

Notes. This exhibit shows descriptive statistics of monthly returns on 13 indices for the period November 1992 to November 2012. Panel A shows annualized mean returns and standard deviations expressed as a percentage, while Panel B shows return correlations expressed as a percentage. Pref is the MSCI REIT Preferred index, REIT is the SNL Equity REIT index, World Ex-US is the SCI World Ex-US index, SP500 is the S&P 500 index, MidCap is the Russell MidCap index, MidCap Growth is the Russell MidCap Growth index, MidCap Value is the Russell MidCap Value index, Rus2000 is the Russell 2000 index, Rus2000 Growth is the Russell 2000 Growth index, Rus2000 Value is the Russell 2000 value index, IG Bond is the Barclays Investment Grade Corporate Bond index, and HY Bond is the Barclays High Yield Corporate Bond index. This is the same sample as Boudry, deRoos, and Ukhov (2016).

stock in the payment of dividends and unpaid dividend sums. The MSCI REIT Preferred Index is a broad-based fund consisting of non-convertible preferred stock traded on the NYSE, AMEX, or NASDAQ that are issued by public U.S. equity and hybrid REITs.

Exhibit 4 provides statistics for the indices used in our analysis. Panel A shows mean return percentages and standard deviations, while Panel B shows return correlations. As shown in Panel A of Exhibit 4, the average annualized return for REIT preferred stock is 10.26 percent with a standard deviation of 11.35 percent. This compares to an average return of 12.89 percent for REIT common stock, which has the highest average return in our sample. The S&P 500 had a mean return of 9.20 percent, the lowest of the domestic equity asset classes. As expected, investment grade bonds had the lowest average return of 7.06 percent, while high yield bonds did slightly better with an average return of 8.33 percent.

The return correlations in Panel B show some noteworthy characteristics about the asset classes. First, preferred stock shares a high correlation with high yield bonds and REIT common

stock, evident in their 67.62 percent and 62.50 percent correlations with high yield bonds and REIT common stock. Second, the 74.61 percent and 77.30 percent correlations between REIT common stock and the MidCap Value and Russell 2000 Value indices highlight the small and midcap value nature of the REIT realm. Finally, investment grade bonds are shown to be the asset class least correlated with the other asset classes in our analysis.

Exhibit 5 shows the current value of a dollar invested in each asset class in 1992. Some clear patterns emerge regarding the time series behavior of the asset classes. Consistent with the average returns observed in Exhibit 4, REIT common stock was the best performing asset class during the sample period. This was not always the case, however. Prior to 2000 REIT common shares were nearly always the worst performing equity index, and up to that time had a total return nearly identical to high yield corporate bonds. In fact, prior to 2002, REIT common stock and preferred stock had similar results. From 2002 to 2007 we observed a marked increase in the performance of small and midcap value, and REIT common

EXHIBIT 5

Value of a dollar invested

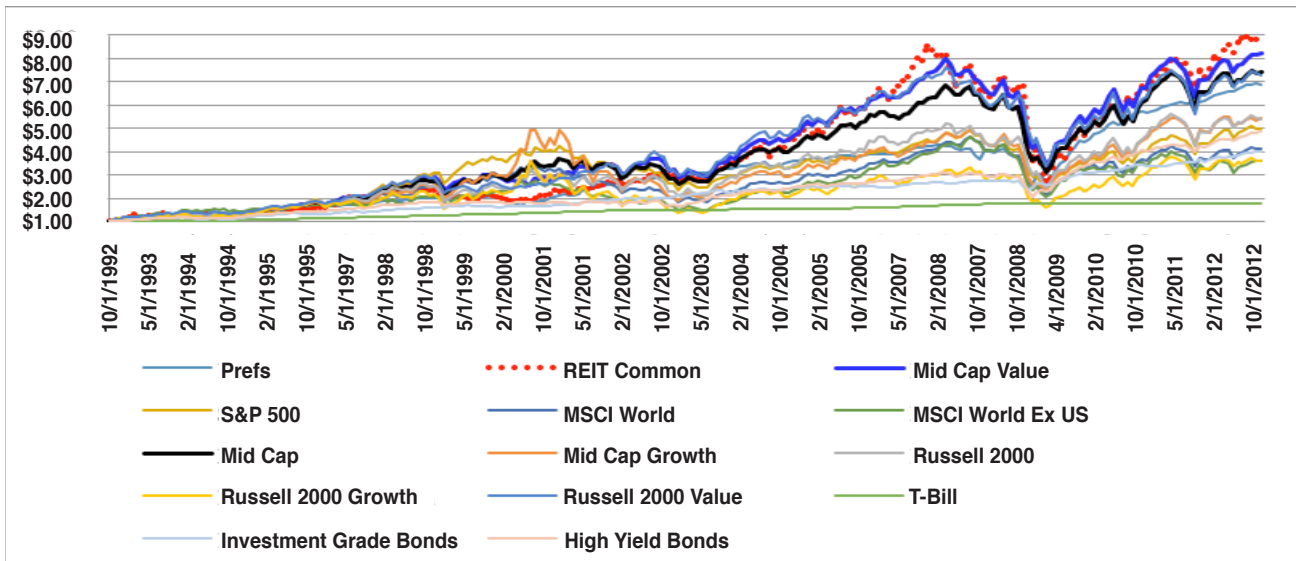
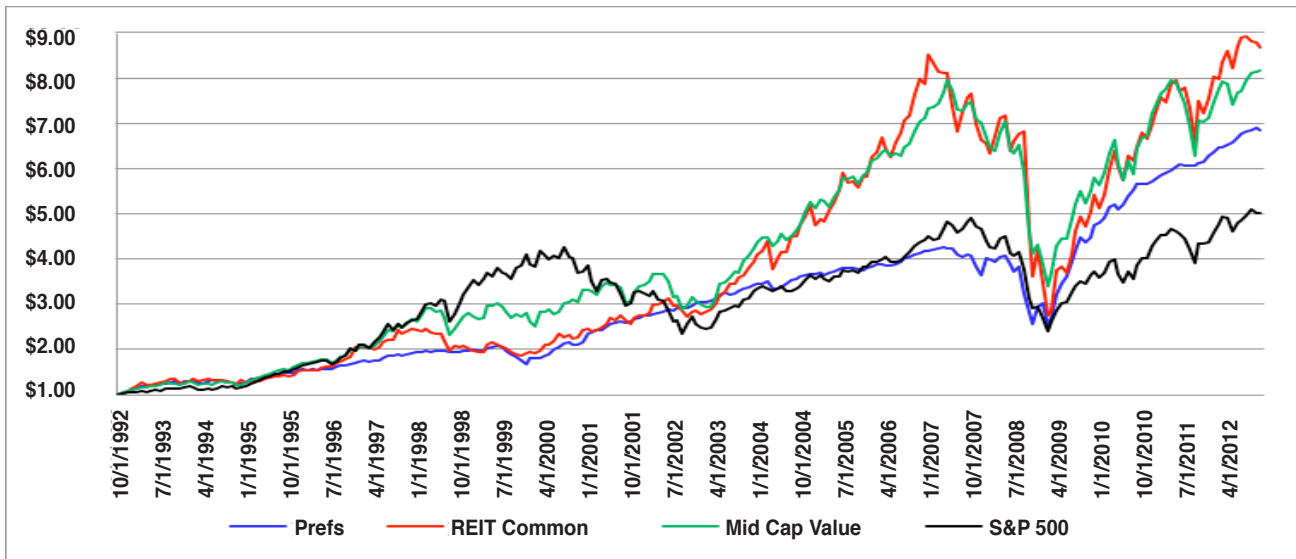


EXHIBIT 6

Value of a dollar invested (select asset classes)



shares. The close relationship between REIT common shares and midcap value stocks is apparent in Exhibit 6, where we plot just the REIT common and preferred shares, the S&P 500, and the midcap value index. The effects of the global financial crisis, subsequent recession, and recovery are evident in the latter part of the sample. All risky asset classes declined significantly during the crisis and rebounded during the recovery. This V-shaped pattern is pronounced in both the REIT common and preferred shares.

Analysis

As a starting point for understanding the diversification benefits of REIT preferred and common stock, we first calculate improvements in the Sharpe ratio from giving an investor access to the REIT market. In this sense we gauge the diversification benefits of the market using the classical mean-variance framework. The Sharpe ratio is the slope of the red line in Exhibit 2. The higher this slope, the better off all investors are.

Classical Sharpe ratio analysis

	Equity Only				Equity and Bonds			
	Market Expected Return	Market St.Dev	Sharpe Ratio	Increase in Sharpe (%)	Market Expected Return	Market St.Dev.	Sharpe Ratio	Increase in Sharpe (%)
Panel A: All Equity Indices								
Including Prefs & REITS	0.158	0.140	0.908	8.258	0.107	0.076	0.998	0.383
Including REITs, No Prefs	0.206	0.207	0.845	0.661	0.106	0.075	0.995	0.070
Including Prefs, No REITs	0.159	0.142	0.907	8.134	0.107	0.077	0.997	0.244
No REITs, No Prefs	0.207	0.211	0.839		0.106	0.076	0.994	
Panel B: S&P 500 and World Ex-US only								
Including Prefs & REITS	0.107	0.112	0.683	64.143	0.082	0.062	0.823	3.846
Including REITs, No Prefs	0.123	0.173	0.536	28.619	0.080	0.060	0.812	2.404
Including Prefs, No REITs	0.105	0.109	0.680	63.394	0.081	0.061	0.817	3.059
No REITs, No Prefs	0.096	0.158	0.416		0.076	0.057	0.793	

Notes. This exhibit shows annualized mean return (expressed as a percentage), annualized standard deviation (expressed as a percentage), and the increase in the Sharpe ratio for optimal portfolios constructed using different investment opportunity sets. Panel A considers the case where the investor has access to all of the equity indices, while Panel B considers the case where the investor only has access to the S&P 500 and the World Ex-US. Lefthand columns consider the case where the investor has no access to bonds, while the righthand columns consider the case where the investor has access to bonds. In each panel, statistics for portfolios including REIT preferred stock, REIT common stock, and both REIT preferred and common stock are reported in addition to the improvement in the Sharpe ratio from the case where no REIT access is allowed. Equity indices are MSCI World Ex-US Index, S&P 500 Index, Russell Mid Cap Index, Russell Mid Cap Growth Index, Russell Mid Cap Value Index, Russell 2000, Russell 2000 Growth, and Russell 2000 Value. Bond indices are Barclays Investment Grade Bond Index and Barclay's High Yield Bond Index.

This is why it is used as a summary measure of diversification benefits in the classical mean variance setting.

Exhibit 7 shows the improvements in Sharpe ratios when the investor is given access to the REIT market. In Panel A we consider the case of a well-diversified investor who has access to all of the equity indices, while in Panel B we consider the case of a less-diversified investor who only has access to the S&P 500 and the World Ex-US. Lefthand columns exclude bonds, while righthand columns include access to investment grade and high yield bonds.

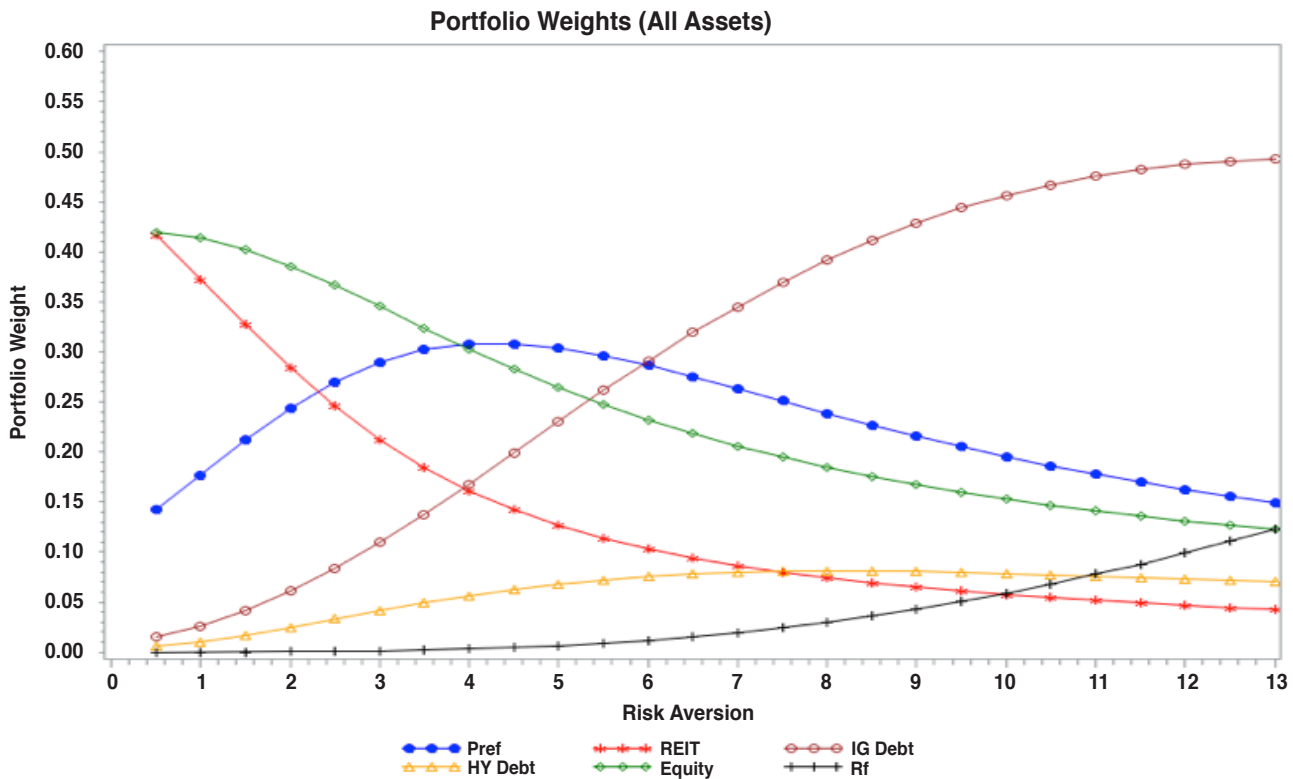
Starting in the lefthand columns of Panel B, we see that access to the REIT market is valuable for a poorly diversified investor. Being able to invest in REIT preferred stock improves Sharpe ratios by 63.4 percent, while access to REIT common stock improves Sharpe ratios by 28.6 percent. To a poorly diversified investor, then, the REIT market is quite valuable. However, if we look at Panel A, we see that REIT common stock provides no benefit to investors. Access to REIT common stock only improves Sharpe ratios by 0.66 percent. REIT preferred stock

still helps investors, improving Sharpe ratios by 8.1 percent, but moving across to the righthand columns of Panel A we observe that this effect disappears in the presence of bonds.

The conclusion to draw from Exhibit 7 is that the REIT market provides no benefits to a well-diversified investor. Still, using Sharpe ratios to measure diversification benefits is predicated on the unconstrained portfolio formation of the classical mean-variance setting. When normal constraints are imposed on the investor's portfolio, it is important to consider alternatives regarding the assessment of diversification benefits.

To further examine the role that REIT preferred and common stock play in an investor's portfolio, the constrained portfolio issue is estimated using historic data. In this setting, the investor can no longer borrow at the risk-free rate or short sell the risky assets. This study shows optimal portfolio allocations across the different asset classes for investors with different levels of risk aversion. In any portfolio allocation experiment, the portfolio weights obtained are a function of the time period used in the estimation. To avoid the possibility that any results are an ar-

Optimal portfolio weights



Notes: The lines trace the weight (vertical axis) expressed as a decimal for each of the asset classes in a portfolio. For any level of risk aversion, the sum of the weight totals 100%.

tifact of the chosen sample period, we conducted a Monte Carlo simulation to generate 10,000 possible histories, incorporating a wide variety of random values and outcomes.⁷ Each history is created by sampling 241 months from the actual sample of return using replacement. This sampling procedure means that inside the Monte Carlo histories, there may be an environment that is in permanent recession, another that is permanently in a boom, and another that replicates the historic sample. Calculating the average portfolio weights allows us to determine the stability of any diversification benefits.

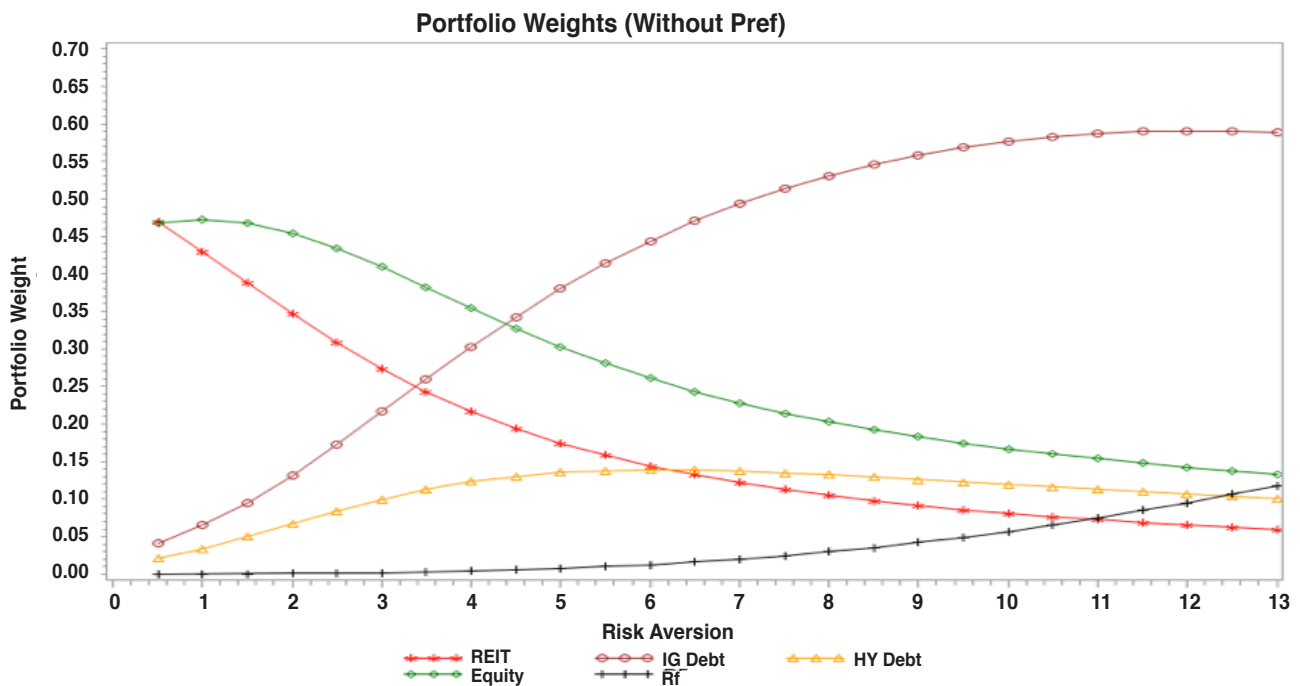
Exhibit 8 shows the mean portfolio allocations for each asset class, averaged across the 10,000 histories. Blue is the allocation to REIT preferred stock, red is the allocation to REIT common stock, green is the allocation to the other equity asset classes, brown is the allocation to investment grade bonds, orange is the allocation to high yield bonds, and black is the allocation to the risk-free asset. The horizontal axis measures risk aversion, with higher numbers reflecting a greater risk aversion.

⁷ Monte Carlo simulations are used to model the probability of different outcomes in a process that cannot be easily predicted due to the intervention of random variables.

The numbers from left to right reflect an increased aversion to risk. Several noteworthy results are evident in Exhibit 8. Very risk tolerant investors (risk aversion of 1-4) have portfolios that are dominated by equity securities and REIT common stock. This is because REIT common stock allows the investor to form high-return portfolios. As risk aversion increases, we observe that the investor quickly moves out of REIT common stock and into REIT preferred stock. At the same time the investor also reduces his allocation to the other equity asset classes and moves toward investment grade and high yield bonds. Finally, for the risk-averse investor (risk aversion of 10-14) we see risk-free assets dominating the portfolio. Over a wide range of risk aversions, REIT preferred stock forms a material part of the investor's portfolio. However, for REIT common stock, we observe that this asset class is mainly valuable to very risk-tolerant investors. So the REIT market does provide diversification benefits, but it provides them to different sets of investors.

A classic investment perspective on preferred stock presented by Graham and Dodd in their value investing text shows

Optimal portfolio weights (excluding preferred stock)



Notes: The lines trace the weight (vertical axis) expressed as a decimal for each of the asset classes in a portfolio. For any level of risk aversion, the sum of the weight adds to 100%.

that preferred stock is a hybrid of debt and equity.⁸ To examine this issue, we repeat the analysis from above, but remove REIT preferred stock from the investment menu. In this sense, a comparison of Exhibit 8 to the weights reported in Exhibit 9 shows which assets displace REIT preferred stock in the investor's portfolio.

A comparison of Exhibit 8 to Exhibit 9 shows that REIT preferred stock displaces allocations to REIT common stock and investment grade and high yield bonds, supporting Graham and Dodd's thesis. However, when investors have access to REIT preferred stock, they choose to invest in it. This implies that, although REIT preferred stock behaves like a hybrid of REIT common stock and investment grade and high yield bonds, investors prefer to invest in REIT preferred stock than to form a replicating portfolio using those other asset classes. This shows that REIT preferred stock has a risk-return profile that is not easily replicated by other asset classes. The allocation of 20 to 30 percent of the investors' portfolio to REIT preferred stock also shows that investors make a big mistake by ignoring the asset class.

To further examine the role REIT stock plays in the investors' optimal portfolio, in Exhibit 10 we show the change

⁸ Graham, B., and D. Dodd. 1934. *Security Analysis*. McGraw-Hill, New York.

in allocation to given asset classes when REIT preferred stock, common stock, and both preferred stock and common stock are added to the investors' choices.

Exhibit 10 also shows that the addition of REIT preferred stock results in lower allocations to REIT common stock over all levels of risk aversion, but most markedly for low risk-aversion investors. For moderate risk-aversion investors, there is a dramatic decline in the allocation to investment grade bonds. Regarding REIT common stock, there is a large displacement of allocation to the other equity asset classes, particularly for low risk-aversion investors, who reduce their allocation to the other equity classes by 26.1 percentage points. These investors also move a substantial amount of their funds to REIT preferred stock. REIT common stock doesn't displace allocations significantly for high risk-aversion investors, because these investors find little benefit from REIT common stock.

Access to both REIT common and preferred stock shows significant movement of allocations across all levels of risk aversion. Once again, this is driven by REIT common stock for less risk-averse investors and by REIT preferred stock for more risk-averse investors. These changes are most pronounced among the other equity asset classes, with low risk aversion investors reducing their allocation by 43.1 percent.

To provide a different view of the results from Exhibits 8 and 9, and to highlight the results from Exhibits 2 and 3, we

Changes in portfolio weights when real estate stocks are added to the investible universe

Risk Aversion	REIT Preferred Added to the Investment Universe					REIT Common Added to the Investment Universe					REIT Common and Preferred Added to the Investment Universe			
	Rf	REIT Common	Equity	IG Debt	HY Debt	Rf	REIT-Pref	Equity	IG Debt	HY Debt	Rf	Equity	IG Debt	HY Debt
1	0.0	-5.8	-5.7	-3.9	-2.3	0.0	-10.2	-26.1	-0.4	-0.5	0.0	-43.1	-6.4	-5.4
2	0.0	-6.3	-6.9	-7.0	-4.2	0.0	-9.2	-18.3	-0.3	-0.6	0.0	-35.0	-10.0	-7.8
3	0.0	-6.1	-6.4	-10.7	-5.8	0.0	-7.7	-12.8	-0.1	-0.7	0.0	-27.0	-13.6	-9.6
4	-0.1	-5.5	-5.1	-13.4	-6.7	0.0	-6.3	-9.4	0.2	-0.7	0.0	-20.5	-16.1	-10.3
5	-0.1	-4.8	-3.8	-14.9	-6.7	0.0	-5.2	-7.3	0.4	-0.6	-0.1	-15.8	-17.2	-10.0
6	-0.1	-4.1	-2.9	-15.3	-6.3	0.0	-4.4	-5.9	0.6	-0.6	0.0	-12.5	-17.2	-9.2
7	0.0	-3.5	-2.2	-14.8	-5.7	0.0	-3.7	-5.0	0.6	-0.6	0.1	-10.3	-16.5	-8.2
8	0.1	-3.0	-1.8	-14.0	-5.1	0.0	-3.2	-4.3	0.6	-0.6	0.2	-8.7	-15.4	-7.3
9	0.1	-2.7	-1.5	-13.0	-4.5	0.1	-2.8	-3.8	0.6	-0.6	0.3	-7.6	-14.3	-6.4
10	0.2	-2.3	-1.4	-12.0	-4.0	0.1	-2.4	-3.4	0.5	-0.5	0.4	-6.7	-13.2	-5.7
11	0.3	-2.1	-1.2	-11.1	-3.6	0.1	-2.2	-3.0	0.5	-0.5	0.6	-6.0	-12.3	-5.2
12	0.4	-1.8	-1.1	-10.3	-3.3	0.1	-1.9	-2.8	0.4	-0.5	0.7	-5.5	-11.4	-4.7
13	0.4	-1.7	-1.0	-9.6	-3.1	0.1	-1.8	-2.5	0.4	-0.4	0.8	-5.0	-10.7	-4.3

This exhibit shows changes in portfolio weights (expressed as percentages) when REIT common stock, REIT preferred stock, and both REIT common and preferred stock are added to the investor's investment universe. For each case the remaining investment universe includes MSCI World Ex-US Index, S&P 500 Index, Russell Mid Cap Index, Russell Mid Cap Growth Index, Russell Mid Cap Value Index, Russell 2000, Russell 2000 Growth, Russell 2000 Value, Barclays Investment Grade Bond Index, and Barclay's High Yield Bond Index.

report changes in the mean Sharpe ratio, portfolio return, and portfolio standard deviation in Exhibit 11, when REIT common stock, preferred stock, and both common and preferred stock are added to the investors' portfolios.

The striking result from Exhibit 11 is that when risk-tolerant investors have access to REIT common stock, their optimal portfolio Sharpe ratio declines. They form a portfolio that has a higher mean return (by 7.4 percent), but the portfolio also has a high standard deviation (by 10.8 percent), and the Sharpe ratio falls by 0.58 percent. This is highly counterintuitive, given that these individuals invest most heavily in REIT common stock. If investing in REIT common stock is not the optimal choice, they could choose to not invest in it. While this appears to suggest that adding REIT common stock to a portfolio is a bad option, it is in fact a limitation of using Sharpe ratios to analyze portfolio performance in the constrained setting. This is an application of the previous discussion related to the differences between Exhibits 2 and 3. When there are constraints on the portfolio, Sharpe ratios cannot be used to judge the best investment choices. Similarly, it doesn't make sense to compare returns or standard deviations. Portfolio weights are the correct way for investors to judge the economic significance of the asset

classes. The significant portfolio allocations to REIT common and preferred stock observed in Exhibit 8 show that these asset classes are important to investors.

Conclusions and Implications

In an environment where investors face constraints on their ability to short risky assets and to borrow at the risk-free rate, the diversification benefits of an asset class are dependent on risk aversion. An asset may provide diversification benefits to one set of investors, but might not be of use to another. This is fundamentally different from the standard Markowitz setting, in which all investors hold the same portfolio of risk assets, and as such, if an asset provides diversification benefits to any investor, it provides those benefits to all investors. This also means that standard metrics of investment performance, such as Sharpe ratios, are no longer valid measures of performance. Confronted with these constraints, investors must be aware of the limitations of such commonly used metrics.

In examining the constrained portfolio problem, we find that REIT common stock benefits risk-tolerant investors by allowing them to form high return portfolios. While measuring risk aversion is difficult, it is possible to see what the portfolios

Changes in Sharpe Ratios, portfolio returns, and portfolio standard deviation

Risk Aversion	REIT Common			REIT Preferred			REIT Common and Preferred		
	Sharpe Ratio	Portfolio Mean	Portfolio Std	Sharpe Ratio	Portfolio Mean	Portfolio Std	Sharpe Ratio	Portfolio Mean	Portfolio Std
1	-0.58	7.37	10.79	7.61	0.94	-3.71	9.91	9.94	6.21
2	-0.30	6.93	9.59	6.86	1.16	-3.45	8.83	9.92	6.40
3	0.19	6.07	7.79	5.73	2.10	-1.48	7.58	10.30	7.94
4	0.59	5.10	6.08	4.72	3.38	1.06	6.55	10.95	9.90
5	0.85	4.27	4.77	4.02	4.61	3.37	5.91	11.45	11.46
6	1.01	3.61	3.81	3.61	5.47	4.93	5.60	11.62	12.14
7	1.10	3.10	3.12	3.41	5.89	5.71	5.49	11.41	12.05
8	1.16	2.72	2.64	3.34	5.94	5.87	5.51	10.91	11.42
9	1.20	2.44	2.30	3.33	5.78	5.69	5.57	10.28	10.56
10	1.22	2.23	2.05	3.35	5.52	5.36	5.65	9.62	9.68
11	1.24	2.06	1.86	3.37	5.22	4.98	5.72	8.98	8.84
12	1.25	1.92	1.71	3.40	4.94	4.63	5.78	8.39	8.10
13	1.26	1.80	1.59	3.43	4.67	4.33	5.82	7.87	7.48

Notes: This shows percentage changes in Sharpe Ratios, Portfolio Returns, and Portfolio Standard Deviations when REIT Common stock, REIT Preferred stock, and both REIT Common and Preferred stock are added to the investor's investable universe. For each case the remaining investable universe includes MSCI World Ex-US Index, S&P 500 Index, Russell Mid Cap Index, Russell Mid Cap Growth Index, Russell Mid Cap Value Index, Russell 2000, Russell 2000 Growth, Russell 2000 Value, Barclays Investment Grade Bond Index and Barclay's High Yield Bond Index.

of these investors look like. A low risk-aversion investor, who cares more about returns, holds a portfolio that is dominated by stocks, with fewer alternative asset classes. These individuals would be well served by examining the REIT market. This is now easier with S&P separating real estate from financials, and designating the real estate sector as the 11th Global Industry Classification Standard (GICS) in its indices.

In contrast to REIT common stock, REIT preferred stock is valued by moderately risk-averse investors, because it provides a venue for risk reduction. As risk aversion increases, investors pay more attention to the risk-return tradeoff, and no longer focus only on more balanced portfolios, with this action coming at the expense of their stock allocations. While they reduce their interest in stocks, they start investing in fixed income securities

such as investment grade and high yield bonds. In our analysis, the risk-return profile of REIT preferred stock is extremely valuable to these investors as it allows them to reduce risk without sacrificing as much return. Investors who like investment grade bonds should also consider the REIT preferred stock because it likely has a risk-return profile that suits their investment profiles.

The results of our analysis also have a practical implication for issuers of REIT preferred stock. We show that REIT preferred stock is a valuable diversifying asset for investors because of its risk-return profile. Issuers can reduce the yield on their preferred stock and still have it be a valuable asset class to investors. In this sense, issuers may have been giving preferred stock investors too good of a deal. ■

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2016 Reports

- Vol. 16 No. 27 Do You Look Like Me? How Bias Affects Affirmative Action in Hiring, by Ozias Moore, Ph.D., Alex M. Susskind, Ph.D., and Beth Livingston, Ph.D.
- Vol. 16 No. 26 The Effect of Rise in Interest Rates on Hotel Capitalization Rates, by John B. Corgel, Ph.D.
- Vol. 16 No. 25 High-Tech, High Touch: Highlights from the 2016 Entrepreneurship Roundtable, by Mona Anita K. Olsen, Ph.D.
- Vol. 16 No. 24 Differential Evolution: A Tool for Global Optimization, by Andrey D. Ukhov, Ph.D.
- Vol. 16 No. 23 Short-term Trading in Long-term Funds: Implications for Financial Managers, by Pamela Moulton, Ph.D.
- Vol. 16 No. 22 The Influence of Table Top Technology in Full-service Restaurants, by Alex M. Susskind, Ph.D., and Benjamin Curry, Ph.D.
- Vol. 16 No. 21 FRESH: A Food-service Sustainability Rating for Hospitality Sector Events, by Sanaa I. Pirani, Ph.D., Hassan A. Arafat, Ph.D., and Gary M. Thompson, Ph.D.
- Vol. 16 No. 20 Instructions for the Early Bird & Night Owl Evaluation Tool (EBNOET) v2015, by Gary M. Thompson, Ph.D.
- Vol. 16 No. 19 Experimental Evidence that Retaliation Claims Are Unlike Other Employment Discrimination Claims, by David Sherwyn, J.D., and Zev J. Eigen, J.D.
- Vol. 16 No. 18 CIHLER Roundtable: Dealing with Shifting Labor Employment Sands, by David Sherwyn, J.D.
- Vol. 16 No. 17 Highlights from the 2016 Sustainable and Social Entrepreneurship Enterprises Roundtable, by Jeanne Varney
- Vol. 16 No. 16 Hotel Sustainability Benchmarking Index 2016: Energy, Water, and Carbon, by Eric Ricaurte
- Vol. 16 No. 15 Hotel Profit Implications from Rising Wages and Inflation in the U.S., by Jack Corgel, Ph.D.
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- Vol. 16 No. 11 The International Hotel Management Agreement: Origins, Evolution, and Status, by Michael Evanoff
- Vol. 16 No. 10 Performance Impact of Socially Engaging with Consumers, by Chris Anderson, Ph.D., and Saram Han
- Vol. 16 No. 9 Fitting Restaurant Service Style to Brand Image for Greater Customer Satisfaction, by Michael Giebelhausen, Ph.D., Evelyn Chan, and Nancy J. Sirianni, Ph.D.
- Vol. 16 No. 8 Revenue Management in Restaurants: Unbundling Pricing for Reservations from the Core Service, by Sheryl Kimes, Ph.D., and Jochen Wirtz, Ph.D.
- Vol. 16 No. 7 Instructions for the Food Preparation Scheduling Tool v2015, by Gary Thompson, Ph.D.
- Vol. 16 No. 6 Compendium 2016
- Vol. 16 No. 5 Executive Insights on Leader Integrity: The Credibility Challenge, by Tony Simons, Ph.D., with Kurt Schnaubelt, John Longstreet, Michele Sarkisian, Heather Allen, and Charles Feltman
- Vol. 16 No. 4 Authenticity in Scaling the Vision: Defining Boundaries in the Food and Beverage Entrepreneurship Development Cycle, by Mona Anita K. Olsen, Ph.D., and Cheryl Stanley
- Vol. 16 No. 3 Communication Planning: A Template for Organizational Change, by Amy Newman
- Vol. 16 No. 2 What Guests Really Think of Your Hotel: Text Analytics of Online Customer Reviews, by Hyun Jeong “Spring” Han, Ph.D., Shawn Mankad, Ph.D., Nagesh Gavirneni, Ph.D., and Rohit Verma, Ph.D.
- Vol. 16 No. 1 The Role of Service Improvisation in Improving Hotel Customer Satisfaction, by Enrico Secchi, Ph.D., Aleda Roth, Ph.D., and Rohit Verma, Ph.D.

CREF Cornell Hotel Indices

- Vol. 5 No. 4 Third Quarter 2016: Hotels Exhibit Positive Momentum, by Crocker Liu, Ph.D., Adam D. Novak, Ph.D., and Robert M. White, Jr.
- Vol. 5 No. 3 Second Quarter 2016: Slowdown for Large Hotels Continues: Small Hotels Have Now Slowed as Well, by Crocker Liu, Ph.D., Adam D. Novak, Ph.D., and Robert M. White, Jr.

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