Exploring Improved Diversification Strategies to Reduce Portfolio Risk

August 31, 2016 | By Ben Maslan, Principal; Eric Willett, Associate; and Matthew Lim, Summer Intern

Summary

Diversification by geographic region has emerged as a key component of real estate portfolio allocation that complements other aspects of portfolio diversity. Existing approaches to geographic diversity frequently rely on a division of the portfolio into regions comprising groups of contiguous states. However, RCLCO's research indicates that diversification based on industry clusters offers a more effective approach to reducing unsystematic risk[1] in a portfolio. This analysis, though it doesn't represent a "final answer," should help investors think more strategically about their geographic diversification.

Developing a Diversification Strategy

This research evaluated the relative validity of two different geographic diversification models: (1) a "contiguous region" approach defined by contiguous U.S. states (the eight NCREIF-defined regions), and (2) an "industry-based cluster" approach that groups metropolitan statistical areas (MSAs) based on similar industry mixes. The most effective approach to geographic diversification would be one in which we see relatively similar returns within geographic categories but low levels of correlation from one category to another. Our analysis suggests that the industry-based cluster approach to geographic diversification reduces this correlation and could help real estate investors diversify unsystematic risk within a portfolio.[2]

NCREIF's National Property Index (NPI) tracks return data for approximately 7,000 commercial real estate properties across the United States. Using NCREIF data for office properties from 1995 to the present, we analyzed the comparative performance of the two geographic diversification approaches.

To create MSA clusters that reflect industry composition, we employed MSA-level employment data by industry provided by the Bureau of Labor Statistics (BLS) for the 50 MSAs with the largest gross metropolitan products. Using a clustering algorithm, we sorted the 50 MSAs into seven clusters that are statistically grouped to combine MSAs with similar distributions of employment across industries.[3] The clustering analysis resulted in the chart below labeled "Industry-Based Clusters."

Using NCREIF data for office returns in the top 50 MSAs from Q1 1996 to Q3 2015, we compared the statistical correlations in performance in the "industry-based cluster" approach to those in the "contiguous region" approach.[4] We analyzed quarterly excess returns relative to the U.S. 10-year Treasury rate in order to control for some of the variation due to market cycles.

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[1] "Unsystematic risk" is the part of an investment's risk that is not due to the entire economic system (known as "systemic risk"). At least a portion of unsystematic risk can be reduced through effective diversification.

[2] Our analysis is based on research initially conducted by Glenn R. Mueller in the 1990s, where he grouped 316 MSAs together by using Standard Industrial Classification (SIC) codes. See Mueller, G. R. (1993). "Refining economic diversification strategies for real estate portfolios." *The Journal of Real Estate Research*, 8(1), 55-68.

[3] Our analysis makes use of a k-means clustering algorithm. K-means clustering is a commonly used cluster analysis technique that groups observations by minimizing the distance between observations.

[4] The portfolios sort the MSAs with properties included in the NPI into either the geographic or industrial categories. Geographic categories reflect NCREIF divisions: Northeast, Mideast, Southeast, Southwest, West North Central, East North Central, Mountain, and Pacific.

Industry-Based Clusters

Government	Professional and Business	Information and Finance	Leisure and Hospitality	Education and Health Services	Natural Resources, Construction, and Manufacturing	Trade, Transportation, and Utilities
Sacramento	Washington, DC	Hartford	Las Vegas	Boston	Chicago	Jacksonville
Birmingham	San Francisco	San Antonio	Orlando	Philadelphia	Cincinnati	Phoenix
Oklahoma City	San Diego	Baltimore	New Orleans	Cleveland	Indianapolis	Tampa
Virginia Beach	Austin	Columbus		Milwaukee	Minneapolis	Atlanta
Riverside	Raleigh	Richmond		Pittsburgh	St. Louis	Denver
		New York City		Providence	Los Angeles	Kansas City
		Bridgeport			Nashville	Salt Lake City
					Portland	Charlotte
					Seattle	Dallas
					Houston	Miami
					Louisville	Memphis
					Detroit	
					San Jose	

RCLCO's analysis found that industry-based clustering offers a more meaningful grouping than the contiguous region approach: the industry-based cluster approach is substantially more effective at explaining the variation in returns, and correlations between industry-based clusters of MSAs are significantly lower than correlations between different contiguous regions. The contiguous region approach adds no meaningful explanatory value to portfolio returns. Indeed, this approach is no better than random at explaining returns, and the approach is insignificant at all generally accepted levels of statistical testing.

In contrast, the industry-based cluster approach is statistically significant in describing real estate returns. Furthermore, the industry-based cluster approach explains over six times as much of the variation in returns as the contiguous region approach does.

Industry-Based Clusters and Contiguous Regions Regression Output[5]

	Industry-Based Clusters	Contiguous Regions
Model Statistical Significance	Highly Significant (p-value=0.00472)	Insignificant (p-value=0.841)
Percent of Variation in Excess Returns Explained by Groupings (R-Squared)[6]	6.6%	1.1%

[5] The p-value is considered to be a measure of the model's significance. The closer the p-value is to zero, the higher the statistical significance of the model. Generally, a p-value lower than 0.1 is considered statistically significant (and greater than 0.1 is considered to not be statistically significant). The r-squared measures the percentage of the variation in the model explained by the regressors. High r-squared values indicate a better-fit model.

[6] The r-squared values reflect the percent of variation in excess returns explained by the two methods. That is, industry clusters explain 6.6% of the variation in excess returns, while contiguous region geographic grouping explain 1.1% of the variation in excess returns. While the high-level grouping methodologies predictably explain a small portion of the variation in both scenarios, the relative r-squared values demonstrate that clustering MSAs by industry distribution substantially outperforms grouping by contiguous regions in explaining the variation in excess returns

In order for the industry-based cluster approach to offer meaningful diversification benefits, the correlation of returns (in excess of U.S. Treasuries) between industry-based clusters of MSAs must be lower than the correlation of returns between geographic regions. Indeed, the average correlation coefficient between the returns of contiguous regions is 0.76, whereas the average correlation coefficient between the excess returns of industry-based clusters is 0.72. While still highly correlated, the 400 basis point decline in average correlation reflects the diversification benefits of a geographic allocation strategy that takes into account the economic structure of MSAs.

Conclusion

Our results based on office real estate performance indicate the value of a nuanced approach to geographic diversification in real estate portfolio allocation. Diversification across commonly accepted regions may provide little added value to a portfolio. Instead, our analysis suggests that diversifying across MSAs with similar economies can reduce correlation between categories and diversify unsystematic risk in a portfolio. Further research will deepen our understanding of diversification within real estate (including other product types) and explore the impact of industry-based diversification as part of a real estate portfolio allocation strategy.

Methodological Note

Historically, the greatest variation in real estate returns has been due to market cycle forces. In order to assess the impact of these groupings on returns, we first controlled for temporal variations using an auto-regressive integrated moving average (ARIMA) model. Subsequently, we compared the variation unexplained by time in the ARIMA model between the two clustering techniques by regressing quarterly excess returns (the residuals of the ARIMA model) on each set of clusters. The summary statistics in each instance measure the validity of the model. The p-value is the probability that observed or more extreme results would occur if the hypothesis being modeled (either industry-based cluster impact excess returns or contiguous region impact excess returns) is false.

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Article and research prepared by Ben Maslan, Principal; Eric Willett, Associate; and Matthew Lim, Summer Intern

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