Value and Momentum in Commercial Real Estate: *A Market-Level Analysis*

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Institutional portfolio management, regardless of asset class, relies on a process. In some instances, the process may be top-down and market oriented. In other situations, the manager can be asset-specific or bottom-up in perspective. Of course, an integrated and iterative approach combines both points of view in making investment decisions.

Likewise, portfolio management across every asset class balances the art and science of investment decision making. The same is certainly true for institutional-grade, commercial real estate investment, although the balance may seem more nuanced. For example, can real estate investors implement investment strategies associated with other asset classes when individual properties are heterogeneous and uniquely owned? In the securities markets, two investors can implement the same strategy with the same security as each is homogenous. For this reason, considerably more publication space has been given to markets where multiple investors might simultaneously implement a common investment strategy.

Our goal is to offer insight on commercial real estate portfolio management and the asset selection component of the top-down investment decision-making process by focusing on market selection strategies at the city or metropolitan-level. We examine two investment strategies that have become increasingly popular with practitioners and can be applied across a wide set of assets: a value strategy and a momentum strategy.

Recently, Asness et al. [2013] authored a remarkably comprehensive study of these two strategies. Although the title of their paper is "Value and Momentum Everywhere," considering a wide range of investment options, commercial real estate was not included in the study. In a sense, the "Everywhere" claim falls just short.

We aim to address this omission by applying their approaches to the analysis of market- or metro-level selection and timing for institutional commercial real estate portfolio managers. The intuition in our analysis is important as it translates into economic value for investors, sponsors, and portfolio managers. Although the investment portfolios we construct at the market level are not directly tradable, the implications and lessons are both bankable and executable as part of a top-down investment strategy.

The value effect is based on the notion that an asset's relative current value is related to future return performance. The momentum effect finds past performance is tied to future returns. To our knowledge, no study simultaneously examines value and momentum strategies across commercial real estate markets.

Our research design takes advantage of the widely studied National Council of Real

Estate Investment Fiduciaries (NCREIF) data. We begin by constructing portfolios of relatively high-value and low-value (i.e., growth) metro areas. The proxy for value is analogous to the inverse of a price-to-earnings ratio (P/E), or in real estate parlance a capitalization rate or net income multiplier; hence the commercial real estate intuition is easily followed. Based on these market-level portfolios, we are able to illustrate the performance and persistence of a value strategy compared with a growth strategy.

Likewise, we construct portfolios based on relatively low and high past performance. Past performance is measured based on the total return for the most recent year. Here, too, we illustrate the returns found from the low versus high past performance strategies. These two approaches allow us to assess the extent to which value and momentum effects are present in the commercial real estate markets. We also examine whether value and momentum factors can contribute to a better specified real estate asset pricing model and whether these factors correlate with macroeconomic conditions.

Our results confirm the presence of value and momentum investment effects in commercial real estate markets. We find that value-based portfolios outperform growth-based portfolios and that positive momentum portfolios outperform negative momentum portfolios. The performance difference between value, momentum, and their alternative strategies is statistically significant, substantial in economic terms, and not explained by the risks associated with these strategies. We also show that the superior performance of portfolios based on either value or momentum are long lasting, which should be particularly appealing to practitioners looking to implement these strategies. Additionally, we show that value and momentum risk factors are essential in explaining the cross-section of real estate returns. We show that a model that includes value and momentum risk factors in addition to the conventional market risk factor exhibits superior explanatory power compared with a single-factor, capital asset pricing model (CAPM) style model.

Overall, our findings are economically intuitive and can have an impact on investment decisions concerning which metro areas to invest in or where and when to reduce exposure. Our analysis at the metro level is useful for investors seeking to identify a particular market or market types for more in-depth or property-specific analysis. Recognizing the economic environment that is likely to foster a higher value or momentum premium can also assist investors in the timing of acquisitions and dispositions. Moreover, the significance of the value and momentum factors in explaining commercial real estate returns is useful in order to construct performance benchmarks for real estate professionals. A possible limitation of our analysis is that it is not property specific and does not include the granularity needed to capture heterogeneity within a commercial real estate metro market. Therefore, future research building on our analysis and using micro-level data may further contribute to the understanding of value and momentum strategies in commercial real estate markets.

This article is organized as follows. We begin by describing the data and the methodologies used to construct metro-level portfolios for the value and momentum strategies. We then discuss our results for the two investment strategies. We expand this analysis by examining the effect of longer holding periods, property-type effects, and implications for asset pricing models. The conclusion highlights potential insights for institutional real estate portfolio managers.

DATA

The primary data source for this study is NCREIF. We employ the total return, as well as the income and capital appreciation components of the NCREIF Property Index (NPI) at the Metropolitan Statistical Area (MSA) level for our analysis.[1] NPI tracks core institutional properties across U.S. markets on a quarterly basis. Although the index begins in the first quarter of 1978, we focus our analysis on the time series from 1986 onward.[2] The shortened analysis period is due to concerns about thin data during the early years of the NPI, as well as major tax changes in the mid-1980s. Currently, the NPI includes approximately 10,000 properties. Apartments, hotels, industrial, office, and retail are the main property types included. The property level data are restricted to operating properties owned by tax-exempt institutions and held in a fiduciary environment. Consequently, there is a high level of confidence in the data.

The return series is obtained on an unlevered and property-value weighted basis. We begin by addressing the potential smoothing issues in the appraisal-based NCREIF data. In doing so, we follow Marcato and Key [2007] and use the first-order autoregressive reverse

filter (FOARF) de-smoothing method with a parameter in the range of 0.40 to 0.60.[3]

In the beginning of our sample period, 47 MSAs are included in the data and the number rises gradually to include 104 MSAs by the middle of 2014. For our analysis, we restrict the sample to MSAs with at least six years of data (i.e., 24 quarters). Due to this data restriction, the highest number of MSAs we analyze is 89, which is the number of MSAs included in the data as of the second quarter of 2008.

METHODOLOGY

Our methodology is most closely related to that of the study by Asness et al. [2013]. Their work provides us innovations to build upon and omissions to address. They examined the combined effects of value and momentum strategies, whereas our study focuses on value and momentum investment strategies, individually.[4] More importantly, and the basis for our contribution, is the fact that we examine commercial real estate as an asset class.

Our research design also benefits from several earlier studies. Sivitanides et al. [2001], for example, provided one of the first studies of value investing in real estate. They showed that investors do not incorporate rent growth mean reversion into their forecasts and, as a result, overvalue and undervalue properties during rent peaks and troughs, respectively. Similarly, Chen et al. [2004] identified a negative relationship between cap rates and the ratio of market value to long-run rents. Hendershott and MacGregor [2005a] found contrasting results to Sivitanides et al. [2001] and Chen et al. [2004] when they examined U.K. real estate data. However, in a follow-up paper Hendershott and MacGregor [2005b] employed an alternative dataset on U.S. commercial real estate and found that real future growth in NOI is positively related to cap rates. This latter finding confirms the value premium previously documented. More recently, Plazzi et al. [2010, 2011] found that a property cap rate, which is a proxy for value, provides information about the property's future returns.[5]

The published work on a real estate momentum effect is surprisingly thin and, mostly, provides evidence from either the securitized market or the housing market. We build upon the methodologies used in this related, albeit sparse, literature.

Portfolio Construction

At the outset, it is important for practitioners to note that the portfolios we construct are based on indexes that are not directly tradable. However, the insights these benchmark portfolio offer can benefit portfolio managers in targeting metro markets, submarkets, or property types within those markets. The robustness and consistency of our results serve as an indication that our portfolio approaches can be extrapolated onto investable real estate portfolios. Therefore, the findings we report using non-traded portfolios are valuable to decision makers.

The construction of our value portfolios is based on the aggregate income multiplier generated by the properties in each metro market (i.e., MSA).[6] The value portfolio includes MSAs associated with a high ratio of income to price (i.e. high cap rate) in the previous year, whereas the growth portfolio includes markets with a low income-to-price ratio. Consistent with earlier studies (e.g., Jegadeesh and Titman [1993] and Fama and French [1996], among others), we create the value portfolios conditioned on the period that spans quarters $t-4$ through $t-2$.[7] Each quarter, we rank all metro areas by their average trailing income-to-price ratio, or cap rate. The purpose of excluding $t-1$ when we rank the MSAs in our sample is to allow all possible information to be available to the decision maker at the time the portfolios are formed. We classify our value portfolio (VP3) as the top third of ranked markets. Our middle (VP2) and growth (VP1) portfolios include the middle and bottom-third ranked markets, respectively. For robustness, we also create value and growth portfolios that include the top and bottom 10% (VT10% and VB10%) of our value-ranked markets. For our base-case analysis, we employ a holding period of one year and portfolio returns are calculated using rolling four-quarter holding period windows.

When constructing our momentum portfolios we rank based on the past total return associated with each metro market. We define a "Positive Momentum" portfolio as one that includes the previous one-year winners, while a "Negative Momentum" portfolio includes the previous one-year losers, each of which is determined on a relative basis. As with the value portfolios, we exclude the most recent period (i.e., quarter, in our case) to ensure full data availability to investors and avoid issues associated with liquidity-related return reversals. We

rank all metro markets by their total return performance during the period that includes quarters $t-4$ through $t-2$ and classify the top, middle, and bottom ranked markets as winners, neutral, and losers, respectively. Similar to our value-based portfolios, we classify our winners portfolio (MP3) as the top third of ranked markets and our middle (MP2) and losers (MP1) portfolios include the middle and bottom third, respectively. Again, our base-case analysis employs a holding period of one year, and portfolio returns are calculated using a rolling four-quarter holding period window. For comparison, we also construct momentum-based portfolios that include the top (MT10%) and bottom (MB10%) deciles of our ranked markets. The construction of these more selective portfolios allows us to determine whether the momentum premium increases with the momentum classification threshold.

Exhibit 1 shows the top 10 metro areas for each value and momentum strategy based on the percentage of time (e.g., number of quarters) each market is in that portfolio. A quick review of the top 10 value cities suggests they are primarily located in the Midwest and the South. These metro areas tend to be less populated (1.33 million),[8] on average, and reflect a lower average property value ($23.8 million)[9] compared with the top 10 growth cities (4.29 million and $84.7 million, respectively). It seems reasonable that the premium return associated with the value strategy may reflect, in part, the illiquidity in these smaller markets. The ability to harvest liquidity opportunities is another aspect of real estate portfolio management.

In contrast to the value strategy metro areas, the top 10 positive momentum cities are more populated with higher value properties (average population of 1.90 million and $63.0 million property value), compared with the top 10 negative momentum cities (populations of 1.00 million and $28.4 million property value, on average). Of the 20 metro areas in the top 10 momentum-based portfolios (Cleveland-Elyria, OH, and Pittsburgh, PA, are the exceptions), 18 are located in coastal states, which may be susceptible to momentum swings due to higher price volatility (i.e., higher risk).

In addition to the base-case one-year holding period, we examine holding periods up to 15 years. Examining longer holding periods aligns the results of this study with more typical holding periods experienced

EXHIBIT 1
Top MSAs Included in Value- and Momentum-Based Portfolios

Top 10 "Value" MSAs	Inclusion %	Top 10 "Positive Momentum" MSAs	Inclusion %
Oklahoma City, OK	89.7%	Rockingham County-Strafford County, NH	62.2%
Louisville/Jefferson County, KY-IN	87.3%	Vallejo-Fairfield, CA	59.6%
Allentown-Bethlehem-Easton, PA-NJ	80.0%	San Diego-Carlsbad, CA	58.6%
Omaha-Council Bluffs, NE-IA	75.0%	Allentown-Bethlehem-Easton, PA-NJ	56.0%
Greenville-Anderson-Mauldin, SC	74.1%	Wilmington, DE-MD-NJ	53.7%
Memphis, TN-MS-AR	70.3%	Greensboro-High Point, NC	52.4%
Columbus, OH	69.4%	Seattle-Bellevue-Everett, WA	52.3%
Warren-Troy-Farmington Hills, MI	69.4%	Boston-Quincy, MA	51.4%
Cleveland-Elyria, OH	66.7%	Oxnard-Thousand Oaks-Ventura, CA	51.0%
Richmond, VA	63.6%	Riverside-San Bernardino-Ontario, CA	51.0%
Top 10 "Growth" MSAs	**Inclusion %**	**Top 10 "Negative Momentum" MSAs**	**Inclusion %**
Santa Rosa, CA	92.3%	Cleveland-Elyria, OH	81.0%
Naples-Immokalee-Marco Island, FL	70.8%	Palm Bay-Melbourne-Titusville, FL	65.4%
San Francisco-Redwood City, CA	64.0%	Port St. Lucie-Fort Pierce, FL	54.5%
W. Palm Beach-Boca Raton-Delray Beach, FL	62.2%	Pittsburgh, PA	54.3%
Los Angeles-Long Beach-Glendale, CA	60.4%	Manchester-Nashua, NH	53.6%
Oxnard-Thousand Oaks-Ventura, CA	56.9%	Providence-Warwick, RI-MA	52.9%
Boston-Quincy, MA	56.8%	Cape Coral-Fort Myers, FL	52.5%
Las Vegas-Henderson-Paradise, NV	54.7%	Lakeland, FL	52.2%
Chicago-Naperville-Arlington Heights, IL	54.1%	Columbia, SC	50.0%
New York-White Plains-Wayne, NY-NJ	52.3%	Santa Rosa, CA	50.0%

Note: This exhibit reports the top 10 MSAs included in the value- and momentum-based portfolios measured as the percentage of the time each MSA is included in each portfolio.

by real estate investors. In order to further investigate the presence of the value and momentum premiums and to enhance the applicability of our results to investors, we also conduct our analysis for different property types within each market.[10]

Risk Analysis

We next examine the extent to which risk factors based on value and momentum have the ability to explain the cross section of commercial real estate returns. We first apply a simple CAPM to our metro market level returns as follows:

$$R_{MSA,t} - R_{f,t} = \alpha_{MSA} + \beta_{MSA}(R_{USA,t} - R_{f,t}) \quad (1)$$

where $R_{MSA,t}$, $R_{USA,t}$, and $R_{f,t}$ are the quarterly returns on the market (i.e., MSA) in question, the average return on the U.S. commercial real estate market, and the risk-free rate, all at time t, respectively. We apply Equation (1) to each of the markets in our sample, separately, and report the average beta across all markets and the t-statistics of that average beta.

In addition to the market risk factor employed in Equation (1), we also construct a value risk factor and a momentum risk factor. The value risk factor (VMG) at time t is defined as the quarterly return on the value (VP3) minus growth (VP1) portfolios. Similarly, the momentum risk factor (MOM) is defined as the quarterly return on the positive (MP3) minus negative momentum (MP1) portfolios. Consistent with our definition of value and momentum investment strategies, we base the portfolios on the previous year's income-to-price ratio and total return, respectively.

We estimate Equations (2) and (3) in order to examine the unique ability of the value and momentum factors to explain real estate returns. We also estimate a three-factor model (Equation (4)) to examine the three risk factors simultaneously and their ability to explain commercial real estate returns.

$$R_{MSA,t} - R_{f,t} = \alpha_{MSA} + \gamma_{MSA} VMG_t \quad (2)$$

$$R_{MSA,t} - R_{f,t} = \alpha_{MSA} + \delta_{MSA} MOM_t \quad (3)$$

$$R_{MSA,t} - R_{f,t} = \alpha_{MSA} + \beta_{MSA}\left(R_{USA,t} - R_{f,t}\right) + \gamma_{MSA} VMG_t + \delta_{MSA} MOM_t \quad (4)$$

As with Equation (1), we apply Equations (2), (3), and (4) to each MSA independently and then compute the average value of the coefficients and their associated t-statistic. A coefficient that is, on average, positive or negative with statistical significance suggests it is useful in explaining cross-sectional commercial real estate returns.

To further assess whether the full specification adequately explains commercial real estate returns relative to the simple CAPM, each MSA's raw returns are compared with the risk-adjusted returns generated from single-factor (i.e., CAPM) and three-factor models. Specifically, we regress the quarterly excess return ($R_{MSA,t} - R_{USA,t}$) of each MSA on the alpha estimate ($\hat{\alpha}_{MSA(CAPM)}$) of that MSA from the CAPM regression. We then repeat the same procedure and regress the MSA's excess returns on their alphas ($\hat{\alpha}_{MSA(3\ factor)}$) from the three-factor model regression. More formally, we estimate

$$R_{MSA,t} - R_{USA,t} = \theta_0 + \theta_\alpha \hat{\alpha}_{MSA(CAPM)} \quad (5)$$

$$R_{MSA,t} - R_{USA,t} = \omega_0 + \omega_\alpha \hat{\alpha}_{MSA(3\ factor)} \quad (6)$$

A θ_α estimate that is positive and statistically significant means the risk-adjusted returns from the CAPM are positively related to the returns that are not risk adjusted. This implies that a significant portion of the cross-sectional commercial real estate return is not explained by the CAPM model. Alternatively, a statistically insignificant θ_α estimate implies that the CAPM is reasonably well specified. A situation where $\theta_\alpha > \omega_\alpha$ indicates that the three-factor model is better specified than the CAPM and suggests that the VMG and MOM risk factors are beneficial in explaining cross-sectional commercial real estate returns. This procedure is analogous to Asness et al. [2013].

RESULTS

The empirical results are described in several sections. The first section addresses the performance of the value- and momentum-based strategies. The next two sections address the influence of longer holding periods and property types on the two strategies. The final two sections examine commercial real estate risk factors associated with the strategies, as well as the relationship between these risk factors and macroeconomic exposure.

Value and Momentum Strategies

Exhibit 2 displays the performance of value- and momentum-based portfolios. The two panels span the Q1:1986 to Q2:2014 time period with an initial index value of 100. Panel A shows the value strategy (VP3) outperforms growth (VP1) by a wide margin, and by 2014, the value strategy reaches an index value that is more than one and a half times the growth portfolio index level. Panel B shows that the positive-momentum strategy (MP3) outperforms the negative-momentum portfolio (MP1) by an even a wider margin than seen in Panel A. By the end of our examination period, the index value of the positive-momentum strategy is as much as three times the value of the negative-momentum portfolio.

The returns achieved by the value- and momentum-based strategies are economically meaningful, and they are consistent with the value and momentum premiums associated with other asset classes. In the case of real estate as an asset class, the superior performance of value over growth shown in Panel A in Exhibit 2 is generally consistent with the findings in Addae-Dapaah et al. [2013], though our data are more current and less vulnerable to small-sample distortions. Consequently, our results may be viewed as more robust and closer to the return premium an investor might expect in today's market environment.

In terms of portfolio turnover, a metro area that enters the value (VP3) or growth (VP1) portfolios based on its yield remains within that portfolio for an average of 2.8 and 2.7 consecutive quarters. In other words, a metro area in the top third or bottom third will, on average, continue to meet that criteria for at least the next six months. This implies that when using a one-year rolling window in order to calculate the returns on these portfolios, the average MSA remains in the value portfolio for 5.8 quarters and in the growth portfolio for 5.7 quarters. Similarly, a metro area that enters the positive momentum (MP3) or negative momentum (MP1) portfolios based on its past performance satisfies the requirement to remain within these portfolios for an average of 5.9 and 5.8 consecutive quarters, respectively.

Exhibit 3 provides more detail on the performance of value and momentum strategies across the full analysis period. The exhibit reports the average excess return over the risk-free rate for each strategy as well as the standard deviation of excess returns, Sharpe ratio, and alpha of each portfolio. Additionally, the exhibit reports the average return differential between our value and momentum strategies.

EXHIBIT 2

Value- and Momentum-Based Investment Strategies (Q1:1986 to Q2:2014)

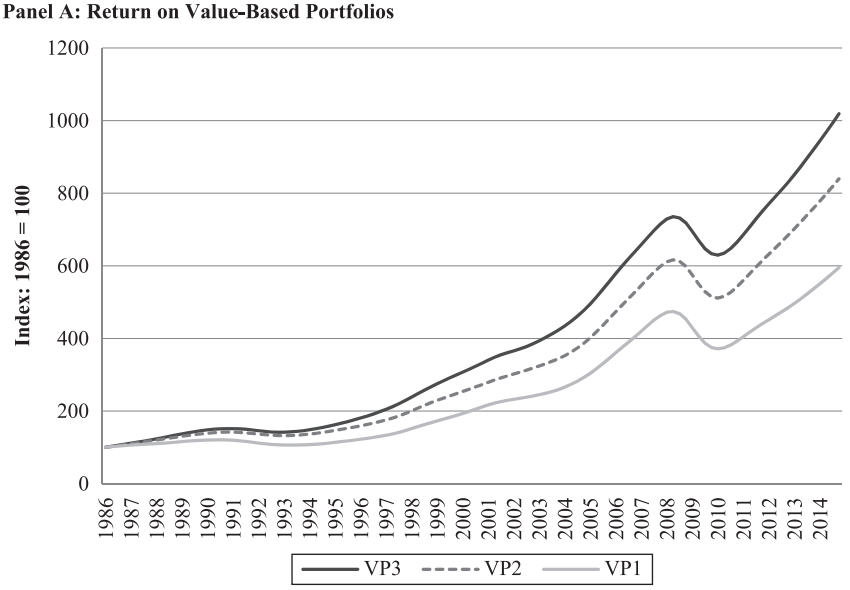


EXHIBIT 2 *(Continued)*

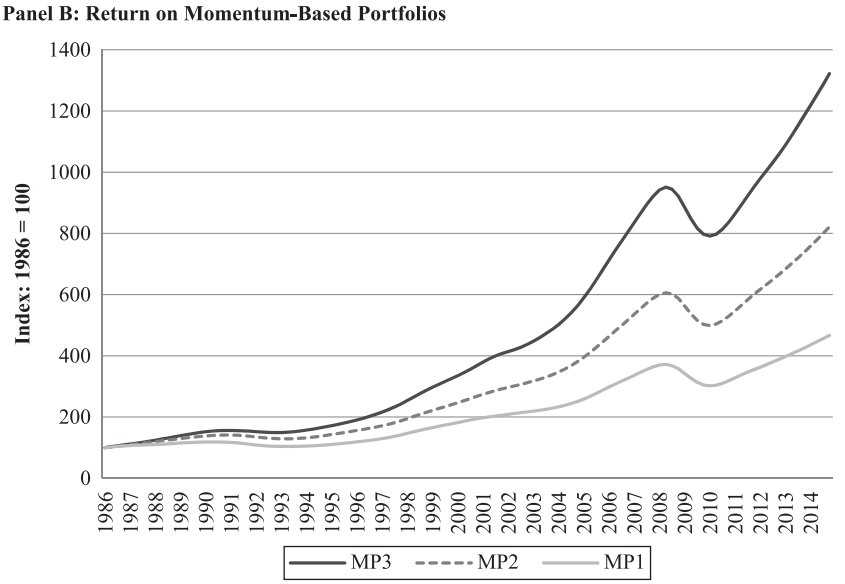


EXHIBIT 3

Performance of Value- and Momentum-Based Strategies

	Value Strategy						
	VB10%	**VP1**	**VP2**	**VP3**	**VT10%**	**VP3-VP1**	**VT-VB 10%**
Mean	1.73%	2.89%	4.13%	4.86%	5.52%	1.97%	3.79%
(*t*-stat)	2.06	3.69	6.08	7.50	8.28	8.07	9.60
stdev	8.88%	8.27%	7.18%	6.85%	7.05%	2.59%	4.18%
Sharpe	0.19	0.35	0.58	0.71	0.78	0.76	0.91
alpha	–2.04%	–0.74%	0.97%	1.93%	2.67%	2.68%	4.71%
(*t*-stat)	–4.84	–2.23	3.41	6.13	6.83	11.99	12.09
	Momentum Strategy						
	MB10%	**MP1**	**MP2**	**MP3**	**MT10%**	**MP3-MP1**	**MT-MB 10%**
Mean	0.68%	1.93%	4.05%	5.91%	6.46%	3.98%	5.78%
(*t*-stat)	0.92	2.77	5.84	8.23	9.06	21.13	19.32
stdev	7.74%	7.36%	7.33%	7.60%	7.55%	1.99%	3.17%
Sharpe	0.09	0.26	0.55	0.78	0.86	2.00	1.82
alpha	–2.50%	–1.25%	0.81%	2.61%	3.26%	3.86%	5.76%
(*t*-stat)	–6.06	–3.92	2.84	8.03	20.73	18.57	17.29

Note: The mean returns on the value and momentum portfolios are in excess of the risk-free rate.

The average excess return on the value-based portfolios is monotonically increasing from VB10% through VT10%, the extreme versions of each strategy. On average, our value portfolio (VP3) outperforms the growth portfolio (VP1) by 1.97% annually, while the difference between the more selective value-based portfolios (VT-VB 10%) averages 3.79% annually. Both differences are statistically significant and economically meaningful. Interestingly, the excess return standard deviation of the value-based portfolios is generally decreasing as the excess return is increasing. The higher return *and* lower volatility results in substantially higher Sharpe ratios for the value strategy versus the growth strategy. This is clearly important for investors looking to implement such a strategy. At the same time, the puzzling pattern in risk–return trade-off suggests that the Sharpe risk metric does not explain the

EXHIBIT 4

Performance of Value- and Momentum-Based Strategies over 3, 5, 10, and 15 Years

Holding Period		Panel A: Value Strategy				Panel B: Momentum Strategy			
		VP1	VP2	VP3	VP3-VP1	MP1	MP2	MP3	MP3-MP1
3 years	Mean	3.14%	4.18%	4.56%	1.42%	2.90%	4.05%	4.92%	2.01%
	Sharpe	0.55	0.84	0.96	0.78	0.57	0.81	0.91	1.31
5 years	Mean	3.79%	4.50%	5.00%	1.21%	3.89%	4.45%	4.95%	1.06%
	Sharpe	0.79	1.01	1.25	0.86	0.90	1.03	1.09	1.03
10 years	Mean	4.83%	5.13%	5.66%	0.83%	5.05%	5.30%	5.30%	0.25%
	Sharpe	1.46	1.66	2.14	1.23	1.62	1.83	1.76	0.65
15 years	Mean	4.93%	5.32%	5.66%	0.73%	5.15%	5.48%	5.31%	0.15%
	Sharpe	2.88	3.57	4.08	2.21	3.02	3.91	3.66	0.55

value premiums we document for commercial real estate. We investigate this issue further in a later section.

As with the value-based portfolios, the average excess return on the momentum-based portfolios is monotonically increasing from MB10% to MT10%. The MP3 strategy outperforms the MP1 portfolio by 3.98% annually, on average, and the MT10% outperforms the MB10% by 5.78%, on average. Unlike with the value-based portfolios, the standard deviation associated with the momentum-based portfolio is not necessarily decreasing as the excess return is increasing but stays within a relatively narrow range of 7.33% to 7.74% for all portfolios. Still, the Sharpe ratio for the positive momentum strategy is as high as five times the Sharpe ratio for the negative momentum portfolio, again suggesting that risk does not explain the momentum return premiums.

The alphas for both the value- and momentum-based portfolios are also increasing, turning from negative to positive as we move from growth or negative-momentum portfolios to the value or positive-momentum strategies. The alpha on a zero-cost, long-short value portfolio surpasses 4.7%, and on a zero-cost, long-short momentum portfolio the alpha is more than 5.7%, each on an annual basis.

Value and Momentum Strategies over Longer Horizons

Commercial real estate investors need to be attentive to transaction costs and investment holding periods. For this reason, we test the robustness of our investment strategies over longer horizons. Specifically, Exhibit 4 provides more detail on the performance of value- and momentum-based portfolios across increasing holding periods. Panel A of Exhibit 4 shows that the superior performance of value compared with growth portfolios decreases gradually but remains positive, as the holding period increases from three to 15 years. The annualized difference between VP3 and VP1 is 1.42% with a 3-year holding period and 0.73% with a 15-year holding period. Moreover, the Sharpe ratios of the value portfolios are higher than that of the growth portfolios for all holding periods examined. This implies, once again, that higher raw returns on value-based portfolios are also higher on a risk-adjusted basis.

Panel B of Exhibit 4 shows similar results for the momentum strategy. Here, the performance of the positive-momentum portfolios compared with the negative-momentum portfolios is higher relative to the value premium for the three-year holding period (2.01%), although it dissipates more quickly and becomes immaterial for the 15-year holding period (0.15%). Nevertheless, on a risk-adjusted basis, the Sharpe ratio shows that positive-momentum portfolios offer superior performance compared with negative-momentum portfolios across the holding periods.

Overall, Exhibit 4 reveals that value and positive-momentum strategies outperform growth and negative-momentum portfolios over different time horizons for both raw and risk-adjusted returns. Because the results we report are on an unlevered basis, investors can view the value and momentum premiums as a conservative approximation of the returns available when leverage is applied.

Property Type Analysis

Our analysis, thus far, has looked at aggregate portfolios combining all property types. A reasonable question is whether value and momentum investment

strategies perform well when the metro markets are disaggregated by property type. In Exhibit 5, we report the performance of value- and momentum-based portfolios using property-type returns for each metro market. These results are largely consistent with the value and momentum premiums documented at the aggregate property level and the single-year holding period shown in Exhibit 3. We conclude that the value and momentum strategies can be applied to a specific property type. This evidence also shows that the superior performance of the value and momentum strategies can be enhanced when it is applied to a larger universe of investment possibilities. Specifically, when the portfolio selection strategies are applied to the set of all property types and metro area combinations (i.e., up to 302 property-type-metro return series are included in our analysis compared with up to 89 metro areas in the earlier analysis), the superior performance of both the value and momentum strategies are clear. Each investment strategy has greater statistical significance and is more economically impactful. The return differential between the value and growth portfolios is as high as 2.64%, whereas the return differential between the positive and negative momentum portfolios exceeds 5%, on average. Once again, the return differential between the value and positive momentum portfolios is not a product of increased risk as each strategy reveals a consistently higher Sharpe ratio relative to the alternative strategy (i.e., growth and negative momentum).

Institutional investors should find these results particularly appealing given that value and momentum strategies each show superior performance across a wide variety of investable properties types. As investors identify more properties to include in their universe of investible properties, they are likely to find higher value or momentum premiums.

Commercial Real Estate Risk Analysis

Now we turn to a closer examination of the risk–return trade-off of these investment strategies. We use a capital asset pricing framework because institutional investors often find themselves addressing real estate portfolio management in a capital market context. To do this, we examine the extent to which market risk, value, and momentum risk factors explain the cross section of commercial real estate returns at the metro-market level. Exhibit 6 reports the average sensitivity of commercial real estate returns to the market (MKT), value minus growth (VMG), and positive minus negative momentum (MOM) risk factors as previously defined.

The parameters reported are the average cross-sectional coefficient estimates from Equations (1) through (4). Our results show that the market risk factor by itself is able to explain a significant portion of commercial real estate returns. The average beta coefficient is 0.90 and the average quarterly unexplained portion of the returns (i.e., alpha) is 0.74%. The coefficients of the VMG (negative and statistically significant) and MOM (positive and statistically significant) factors, when examined independently, also demonstrate some

EXHIBIT 5
Value and Momentum Performance by Property Type

Holding Period		Panel A: Value Strategy				Panel B: Momentum Strategy			
		VP1	VP2	VP3	VP3-VP1	MP1	MP2	MP3	MP3-MP1
All	Mean	2.63%	4.30%	5.27%	2.64%	1.50%	4.19%	6.50%	5.01%
	Sharpe	0.30	0.57	0.74	0.93	0.19	0.56	0.81	1.88
Apt.	Mean	5.43%	6.65%	9.05%	3.62%	4.93%	7.18%	9.07%	4.13%
	Sharpe	0.72	0.89	1.23	1.23	0.67	1.02	1.15	1.41
Indust.	Mean	3.28%	4.62%	4.92%	1.64%	2.39%	4.16%	6.29%	3.90%
	Sharpe	0.39	0.60	0.68	0.64	0.32	0.54	0.77	1.34
Office	Mean	1.23%	2.61%	3.87%	2.63%	0.34%	2.75%	4.63%	4.29%
	Sharpe	0.11	0.27	0.44	0.53	0.03	0.28	0.47	0.98
Retail	Mean	4.65%	5.17%	5.51%	0.86%	3.96%	5.16%	6.23%	2.27%
	Sharpe	0.54	0.60	0.70	0.39	0.47	0.61	0.77	1.52

Notes: This exhibit reports the performance of value- and momentum-based portfolios by segmenting the NPI by MSA and property type classifications. All, Apt., Indust., Office, and Retail refer to all property types, apartments, and industrial, office, and retail property types, respectively. Due to data limitations, the returns on apartments and retail begin in 1992 and 1988, respectively.

EXHIBIT 6
Commercial Real Estate Risk Factor Analysis

Specification	Alpha	MKT	VMG	MOM
(1)	0.0074	0.9028		
	(13.55)	(39.44)		
(2)	0.0233		–1.6334	
	(43.76)		(–15.76)	
(3)	0.0127			0.5822
	(17.81)			(4.08)
(4)	0.0063	0.8858	–0.0918	0.0620
	(7.76)	(39.17)	(–1.16)	(0.47)

Notes: This exhibit reports the average regression coefficients and their t-statistics (in parenthesis) from Equations (1)–(4). MKT, VMG, and MOM are the market, value, and momentum risk factors, respectively.

ability to explain commercial real estate total returns. However, the alpha coefficient under specifications (2) and (3) is materially larger than it is under specification (1) at 2.33% and 1.27% per quarter, respectively. When the VMG and MOM risk factors are included in the model with market risk (specification (4)), the coefficients of the value and momentum factors turn insignificant. The alpha measured for this three-factor model is slightly lower (0.63%) than it is in specification (1). The importance of properly accounting for risk in commercial real estate portfolio management can be seen here in the choice of benchmark, which factors into effective performance monitoring. In the case of a single-factor pricing model, the manager may be credited with superior performance based on alpha. By using a potentially more robust benchmark, the alpha performance factor is muted.

Exhibit 7 illustrates the contribution of the VMG and MOM risk factors in addition to the market risk factor when explaining commercial real estate returns. Panel A shows the regression results from Equation (5). The θ_α estimate from the regression is 0.58 and is statistically significant at the 1% level (*t*-stat of 10.58). Additionally, the R-squared of the regression is nearly 57%. Because the alpha from the CAPM model is significant and positively related to the raw excess return, we conclude that much of the commercial real estate cross-sectional return is *not* explained by the single-factor CAPM. Panel B of Exhibit 7, which is based on the regression results for Equation (6), shows a sharp contrast with Panel A. At 0.05 (*t*-statistic of 0.95), the ω_α estimate is not statistically different from zero and a tenth the size of θ_α estimated from Equation (5). Moreover, the R-squared of the regression is approximately 1%, which is also materially lower than the R-squared of Equation (5).

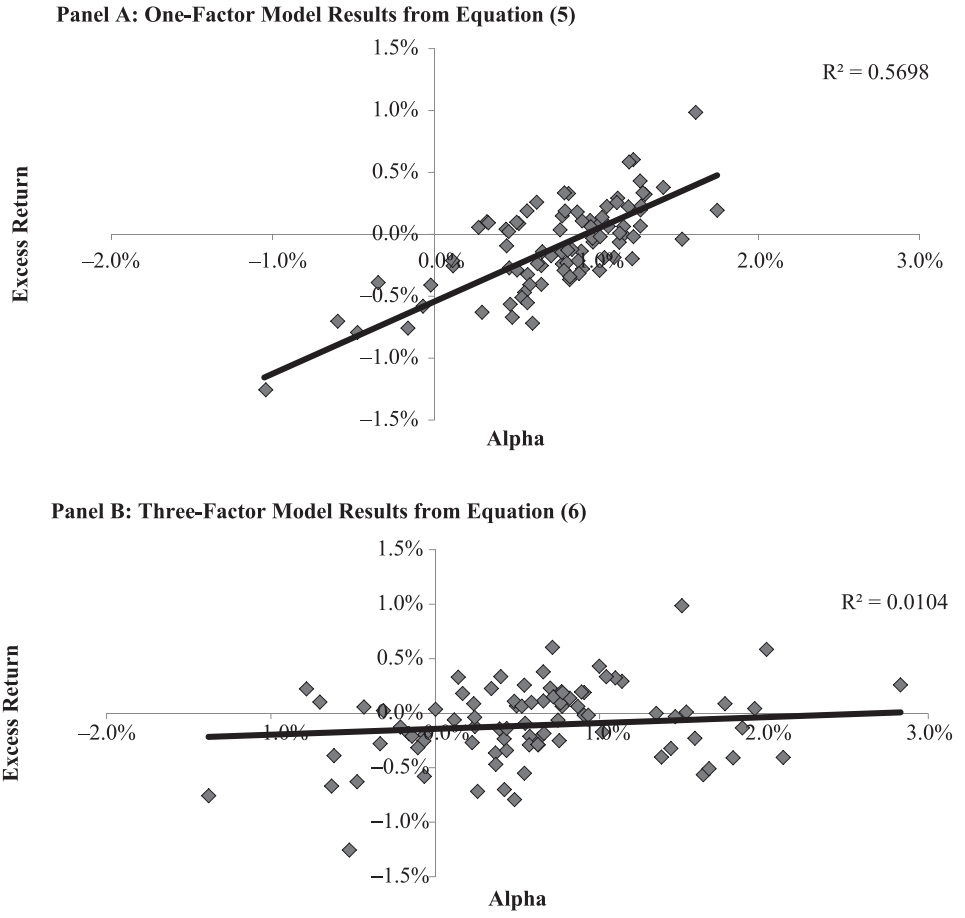
We interpret the results presented in Panel B as evidence that the three-factor model, which includes the VMG and MOM factors (in addition to market risk), is better able to explain cross-sectional returns. This interpretation is consistent with the fact that alphas (or the risk-adjusted returns) from the three-factor model are not related to the raw returns at the MSA level. Therefore, we conclude the three-factor model is superior to the CAPM in explaining commercial real estate returns. More importantly, we argue the three-factor model—based on value and momentum strategies—is a more theoretically sound benchmark for institutional investors to use in gauging risk-adjusted performance.

Value and Momentum Strategies and Macroeconomic Intuition

In this section, we investigate the macroeconomic intuition behind the value and momentum strategies applied to commercial real estate. To do this, we first determine whether the performances of value- and momentum-based commercial real estate portfolios are sensitive to U.S. economic conditions. Again, we follow Asness et al. [2013] and regress the value and momentum premiums (VP3–VP1 and MP3–MP1, respectively) on a set of conditioning variables. We conduct the regression analysis at the univariate level (i.e., one explanatory factor at a time) and with the full set of macroeconomic variables simultaneously using multivariate analysis.

The time series regression results are shown in Exhibit 8. The macroeconomic variables include an expansion indicator, GDP growth, long-run consumption growth, U.S. stock market returns, commercial real estate market returns, the Fama and French [1993] bond market factors DEF and TERM, employment, and capital flow. Our expansion indicator, based on trough and peak dates obtained from the NBER, equals 1 between trough and peak periods, and 0 otherwise. Quarterly U.S. GDP growth is in real per capita terms and obtained from the NIPA (i.e., National Income and Product Accounts). Long-term consumption growth is the three-year future growth rate in per capita nondurable real consumption (also from NIPA). Stock market and commercial real estate returns are future one-year returns net of the risk-free rate. Finally, employment

EXHIBIT 7
CRE Asset Pricing Performance: One-Factor and Three-Factor Models



is measured quarterly as the percentage change in the nonfarm payroll and capital flow, which we obtain from the Bureau of Economic Analysis (BEA), and is scaled by GDP.

Exhibit 8 shows the multivariate regression yields a positive and statistically significant relationship between the value premium and long-run consumption growth and employment. The value premium is negative related with statistical significance to future CRE returns. The univariate regression results presented in column (1) show similar sensitivity for the value premium to each of the macroeconomic factors with the exception that employment is no longer significant and capital flow is negative and statistically significant. We interpret these results as showing that value-based metro markets perform particularly well relative to growth markets when the overall commercial real estate market weakens and when consumption and employment are improving.

The momentum premium results are reported in Exhibit 8, columns (3) and (4). Here, we find that positive momentum metro markets perform particularly well relative to negative momentum markets as the economy strengthens (i.e., employment grows and capital flows are high) and when the overall commercial real estate market performs poorly, although the real estate effect is only marginal. With the univariate analysis, the coefficient of the commercial real estate market variable loses its statistical significance, while coefficients of two other variables, the expansion dummy and GDP growth, both of which indicate a strengthening economy, turn positive and statistically significant. We find it interesting that these results are consistent with the findings reported by Asness et al. [2013] for U.S. stocks. At the

EXHIBIT 8

Macroeconomic Exposures of Value- and Momentum-Based Commercial Real Estate Portfolios

	Value Premium		Momentum Premium	
	(1) Univariate	(2) Multivariate	(3) Univariate	(4) Multivariate
Expansion dummy	–0.118	0.000	0.020	0.004
	(–1.50)	(0.00)	(3.49)	(0.50)
GDP growth	0.111	0.137	1.157	0.483
	(0.27)	(0.31)	(3.96)	(1.29)
Long-run consumption growth	0.325	0.237	0.111	0.049
	(4.32)	(3.32)	(1.83)	(0.83)
Stock market return	0.021	0.024	–0.004	–0.007
	(1.50)	(1.82)	(–0.37)	(–0.62)
CRE market return	–0.180	–0.225	0.023	–0.05
	(–7.23)	(–7.66)	(0.97)	(–1.98)
DEF	0.086	0.041	0.016	0.1597
	(0.85)	(0.42)	(0.21)	(1.90)
TERM	0.024	–0.003	–0.84	–0.01
	(0.30)	(–0.04)	(–1.36)	(–0.17)
Employment	–0.099	1.41	1.940	1.540
	(–0.18)	(2.37)	(5.25)	(3.02)
Capital flow	–0.252	–0.072	0.444	0.377
	(–2.09)	(–0.68)	(5.24)	(4.11)
Adj. R-square		49.89%		34.82%

Note: This exhibit reports the coefficients and their t-statistics (in parentheses) from the results of the time series regressions exploring the macroeconomic exposures of the portfolios.

same time and given that commercial real estate investments are capital intensive and, therefore, sensitive to interest rates, we are surprised to find that neither of the interest rate variables (i.e., DEF and TERM) exhibits meaningfully consistent correlation with the observed value and momentum premiums.

Overall, we conclude from the Exhibit 8 results that the momentum premium is high when the economy strengthens, while the value premium is high as the economy shows signs of stability (long-term consumption growth) and the aggregate commercial real estate market weakens. The fact that the two premiums are sensitive to different macroeconomic factors implies a diversification benefit for investors when both strategies are employed.

CONCLUSION

Value and momentum strategies are well recognized in the capital markets. Yet, the evidence on value and momentum with respect to commercial real estate is limited. Our work attempts to address this issue by investigating 1) the value and momentum premiums in commercial real estate returns and 2) the contribution of value and momentum as risk factors.

Employing the NCREIF Property Index at the metro or MSA level, we find that commercial real estate portfolios based on value and positive-momentum strategies outperform portfolios based on the alternative strategies—namely, growth and negative momentum. This result holds for total returns on both a raw and risk-adjusted basis. The superior performance of the value- and momentum-based strategies is not only statistically significant, it is also economically meaningful and sustainable for up to a 15-year investment horizon. Furthermore, our results highlight the contribution of value and momentum risk factors to commercial real estate asset pricing. Finally, we illustrate that value and momentum strategies each correlate with varying, yet different, macroeconomic conditions. The value premium is stronger when the overall commercial real estate market weakens, and the momentum premium appears to be driven by strong economic growth.

Although our results are generated with NCREIF indexes that not directly investable, the practical

implications for portfolio managers are compelling and the strategies themselves can be implemented. The consistency and robustness of our results provide support for an institutional real estate investor seeking to employ a value or momentum strategy in identifying a target city, area, or property type in the purchase or sale decision. Moreover, the correlations across macroeconomic conditions and the value and momentum strategy premiums can also assist investors with decisions in acquisition timing and disposition. Finally, the analysis suggests that institutional portfolio managers may want to consider value and momentum factors when monitoring performance and establishing benchmarks.

It is also important to note the need to understand value and momentum effects at the individual property level. Such analysis would build upon our study. The issue of whether value and momentum strategies are more effective at the market level, as shown here, or at the property level is an empirical question. Using micro-level data to examine value and momentum in commercial real estate portfolio management seems to be a fertile area for future research.

ENDNOTES

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[1]We also analyze the NPI at the state and sub-MSA (i.e., property type and MSA) levels. The overall findings at these levels are consistent with our findings at the MSA level.

[2]We thank an anonymous reviewer for suggesting we focus on data from 1986 onward because the time period may be more relevant for practitioners seeking to implement these investment strategies. For robustness, we also analyze the complete time series from 1978 and, separately, from 1990 onward. The overall findings using these different time periods are consistent with our finding using the time series from 1986 onward.

[3]Specifically, we use a 0.50 parameter in our analysis. However, we also confirm that our general results are robust when using parameter values as low as 0.40 and as high as 0.60.

[4]For completeness, we also examine the combination strategy of Asness et al. [2013]. In the case of commercial real estate, the combination strategy is statistically and economically significant. However, the combination strategy risk-adjusted returns seem no more potent than a simple blend of the two strategies. Asness et al. [2013] used a combination strategy for various capital market assets that yielded additional power attributed to a negative correlation between value and momentum effects.

[5]Addae-Dapaah et al. [2013] analyzed two property types (i.e., office and retail) across the United States and a small set of Asian cities to determine the relative performance of value-based investment strategies. Although their contribution is meaningful, their study does not consider the momentum effect in isolation or simultaneously with the value effect. Additionally, their study might suffer from various sample-size issues and the possibility that one country or region drives a significant portion of their results.

[6]We use property net operating income (NOI) as our proxy for income in this article.

[7]As a robustness test, we analyze the data using quarters $t-4$ through $t-1$. The results are similar to those reported here.

[8]Population calculations are based on 2010 U.S. Census estimates.

[9]Average property value calculations are based on Q2 2014 metro market value and the number of properties in each market as reported by NCREIF.

[10]Additionally, we subject our findings to a series of robustness tests. These robustness tests include an examination of the value and momentum premiums during different subperiods, analysis at the state level, and analysis under a constraint that avoids an MSA "new issuance bias." For brevity, we do not report the results of these robustness tests here. They are available from the authors on request.

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