Understanding Commercial Real Estate: *How Different from Housing Is It?*

JOSEPH GYOURKO

JOSEPH GYOURKO
is the Martin Bucksbaum professor of real estate and finance and the director of the Samuel Zell and Robert Lurie Real Estate Center at the Wharton School, University of Pennsylvania, in Philadelphia, PA.
gyourko@wharton.upenn.edu

Over the past year, the unprecedented 19% decline in nominal house prices for the 20 major markets tracked by the S&P/Case-Shiller Home Price Indices, with futures markets predicting further drops, naturally raises the question of whether commercial, or income-producing, real estate will follow a similar path.[1] Public commercial property firms already have traded down sharply according to the National Association of Real Estate Investment Trusts (NAREIT) index for such firms, as reflected in the 20%–30% implied average decline in their underlying property values from the peak in February 2007.[2] Measured returns on privately held commercial properties lagged the public market as usual, but write-downs over the past three quarters through the first quarter of 2009 reflect about a 20% drop in the values of properties in the National Council of Real Estate Investment Fiduciaries (NCREIF) Index.

The first part of this article investigates just how similar or different we should expect outcomes in owner-occupied housing and income-producing real estate to be. The analysis begins by examining what urban economic theory and the "bubbles" literature in asset pricing have to say on the issue. The data are then explored to see how outcomes vary across the housing and commercial property sectors over time and by metropolitan area. The second part of the article documents and analyzes various risk characteristics of income-producing properties. The large size of the commercial property markets, combined with their high financial leverage, makes their study especially important given current weakness in the financial sector.[3]

Urban economic theory suggests that commercial real estate and housing are driven by common fundamentals, which should make them perform similarly. But stronger limits to arbitrage in housing suggest that wider swings in prices unrelated to fundamentals are feasible in that property sector. The data indicate many more similarities than differences across the two real estate sectors, with the simple correlation between appreciation rates on owner-occupied housing and commercial real estate being about 40%. Both sectors also exhibit similar time-series patterns in their price appreciation, having persistence across individual years and mean reversion over longer periods. Given the recent dramatic declines in house prices, these strong similarities are foreboding, as the commercial real estate capital structure looks to be quite weak due to high leverage combined with strong mean reversion in prices. Other data indicate that investor and lender optimism was present in the commercial property sector, not just housing, during the recent boom.

SHOULD HOUSING AND COMMERCIAL REAL ESTATE MOVE TOGETHER?

The core model of spatial equilibrium in urban economics indicates that the fundamental sources of demand for both housing and commercial real estate are quite similar. In this compensating differential framework introduced by Rosen [1979] and Roback [1982] nearly three decades ago, land prices are the entry fee that households and firms must pay to access the productivity and amenities of a labor market area. Higher land values have to be paid to enter a metropolitan area with more productive firm clusters or nicer weather. Because land is substitutable on the margin between uses, the prices of both residential and commercial property will move together if local productivity or the amenity set changes. The essential insights of this model have been confirmed in numerous studies of house price and wage differences across metropolitan areas (Gyourko, Kahn, and Tracy [1999]).

One counter to this equilibrium view is that certain features of the housing market make it more likely for its prices to become disconnected from fundamentals. If so, the link between common urban fundamentals and performance across the two property sectors could be cut. The bubbles literature in asset pricing suggests that wide swings in prices, which are not justified by fundamentals, are more often present in markets with higher transactions costs and in which it is harder to sell short (e.g., DeLong et al. [1990]; Barberis, Ming, and Santos [2001]; Hong, Scheinkman, and Xiong [2006, 2008]). Both are well-known features of real estate markets, and of owner-occupied housing in particular. The costs of directly exchanging a single-family home or any type of commercial property between two parties are very high compared to most other assets—at least 6%. However, fractional interests in pools of commercial properties can be cheaply transacted in the publicly traded equity REIT market. Trading in owner-occupied homes is done only infrequently by amateurs who typically must reside in their home if they are to sell it. As for shorting, it was virtually impossible to do in single-family housing until the recent advent of the S&P/Case-Shiller futures contracts for some markets. Trading in these contracts is very light, so in a practical sense, almost no shorting of owner-occupied housing exists. Shorting commercial real estate is not easy either, but it can be done more readily via the public markets with equity REITs.

Glaeser and Gyourko [2008] argued that the limits to arbitrage are weak enough in housing that even highly skilled professional traders would have difficulty precisely pinning down the appropriate price for housing at any given point in time. Their argument, based on an analysis of the precision of the user-cost-of-housing-demand framework, rests on there being substantial uncertainty about the true values of a number of components of the user cost of owner-occupancy.[4]

Those authors also argued that the option to delay or accelerate purchase (or sale) of an asset to exploit temporary price deviations from fundamentals, which narrows rational pricing bounds in many markets (Shleifer and Vishny [1997]), are not fully operational in the owner-occupied housing market. Unlike a single stock, owner-occupied housing is such a large component of most households' wealth that risk neutrality cannot be presumed. Risk aversion and high price volatility in housing markets can combine to make it very risky to delay purchase decisions, especially by renters, even if they believe prices will fall in the next year. Essentially, annual price volatility in many markets is high enough that even a modest degree of risk aversion will encourage nonwealthy renters not to delay purchases.

This is not to imply that there are no limits to arbitrage in commercial real estate markets, only that they are less strong. Trading is done by professional investors who do not have to occupy buildings in order to buy and sell them. Rent on comparable buildings also has clearer meaning for investors in income-producing properties. Because a deep rental market in single-family detached housing does not exist, the comparable buildings used to measure rents tend to be apartments. The residential rental stock tends to be composed of denser multifamily units that are more likely to be located in the central city of a metropolitan area, and because they are occupied by lower-income households, their demand can be quite different from that of owner-occupied housing. None of these distinctions really applies to the commercial sector, which makes valuation more straightforward.

Not everything argues for tighter arbitrage bounds in the commercial sector, however, as it is no easier to accurately measure true economic depreciation or predict likely appreciation rates for commercial buildings than it is for owner-occupied housing. In addition, there is more quality variation among office buildings and shopping centers than there is among single-family homes, which makes it harder to evaluate the former. It seems reasonable, however, to presume risk neutrality for the many large multi-billion-dollar professional investment firms that now exist in the commercial real estate industry. In the absence of risk aversion, one would expect deviations from fundamentals to be corrected pretty quickly, as large investors who believe they can predict the direction of prices in the short run, either delay or accelerate purchase (or sale) decisions to take advantage of perceived price discrepancies.

In summary, whether stark differences in the limits to arbitrage trump the influence of common fundamentals at the heart of the Rosen-Roback model is an empirical question that cannot be answered by theory. Hence, we turn to the data to see whether the commercial property sector tends to perform in a fundamentally different way from the housing sector.

COMMERCIAL REAL ESTATE DATA: CYCLES AND CORRELATION WITH THE HOUSING MARKET

This article uses data from the public and private markets in its analysis of the commercial property sector. The public market data are for equity real estate investment trusts (REITs). This market dates back to the early 1960s, but the entire market capitalization of the sector was under $7 billion until the early 1990s. Therefore, it is only over the last 15 to 20 years that this market is thought to be a reasonable proxy for what is happening in commercial property markets. Data on the prices and returns of an index of equity REITs compiled by NAREIT are used.[5]

NCREIF also compiles an income-producing real estate index, which reflects the returns on and values of properties owned in the private markets, primarily by or for institutional investors. As of the first quarter of 2009, this index comprised 6,071 properties with an appraised value of $269 billion. One important difference between this series and the NAREIT index is that the NCREIF returns are computed on an unleveraged basis (i.e., it is as if the properties were acquired with cash). Another difference is that the NCREIF properties are determined by appraisals, which typically occur only once a year.[6]

A third source of data examined on commercial real estate is the Transactions-Based Index (TBI), which is computed by the MIT Center for Real Estate based on sales out of the NCREIF index.[7] In some quarters few sales occur, so the underlying sample sizes are sometimes small. This transactions-based series deals with the standard worries about "stale" prices due to infrequent appraisals biasing measured correlations of the full NCREIF Index with the returns on other assets (Gyourko and Keim [1992]; Gyourko [2004]).

For owner-occupied housing, we use the Federal Housing Finance Agency (FHFA) repeat-sales price index series to measure house price appreciation.[8]

Exhibit 1 reports the simple correlation of real annual price appreciation on each commercial real estate series with the real price growth in the FHFA index. The appropriate comparison is in terms of changes in capital values, not total returns, because only the growth in prices is observed on owner-occupied housing. Annual periods were used to minimize the biases associated with infrequent appraisals in the NCREIF series. The FHFA, NCREIF, and NAREIT series each begin in 1979, the first full year for which appreciation can be computed for the NCREIF index. Annual appreciation in the TBI can be computed beginning in 1984, so that correlation coefficient is based on 24 years of data, not the 30 years available for the others. The results are not materially affected if we restrict each series to begin in 1984.

The results shown in Exhibit 1 highlight that the housing and commercial property markets do, in fact, move together. Real price growth on income-producing properties is strongly positively correlated with real house price appreciation, regardless of the commercial property series. The simple correlations of housing with the NCREIF and NAREIT data are just below 40% and with the MIT transactions-based index the correlation is 65%. The point here is not to take a stand on which correlation is "more correct," but to emphasize that real price appreciation in housing and commercial property markets moves together

EXHIBIT 1

Correlation of Real Annual Appreciation Rates Commercial Real Estate vs. Owner-Occupied Housing

	Correlation with FHFA
NAREIT	0.38
NCREIF	0.39
TBI	0.65

Notes: Correlations of FHFA real annual appreciation with that on NAREIT and NCREIF are based on 30 years of data from 1979–2008; Correlation of FHFA real annual appreciation with that on the TBI is based on 24 years of data from 1984–2008.

positively at annual intervals. The robustness of the positive correlation between appreciation in housing and commercial property markets is striking, especially given the well-known fact that the NCREIF and NAREIT series are not positively correlated themselves on a contemporaneous basis because of appraisal lags and other factors (Giliberto [1990]).

Although these results are consistent with the implication of the Rosen-Roback model that the different sectors of real estate will move together over time, it should also be the case that booms in one property sector within a metropolitan area show up in other sectors within the same market. To investigate this, the ratio of price to construction cost for office buildings was compared to that for housing within the same metropolitan area. The gap between sales price and construction cost reflects both the developer's profit margin and the cost of land. Although gross profit margins for homebuilders and commercial developers, which tend to be between 15% and 20%, can vary over the cycle, land value is expected to be the most volatile factor because it is the residual claimant on project value. Hence, changes in ratio of price to construction costs are interpreted as primarily reflecting changes in implied land values.

Actual transaction prices on commercial properties are not widely available, but information on office buildings was obtained from Real Capital Analytics, a real estate research firm and data provider, for the period between 2003 and 2008. This time frame is short, but it does cover the most recent boom period in the commercial property market. In addition, this source disaggregates its data geographically into sales inside and outside the central business district (CBD) of the metropolitan area.

Physical construction costs were obtained from the R.S. Means Company and pertain to an 80,000-square-foot, 5- to 10-story, specific office building, typical of office product in many markets, especially in suburban office parks.[9] The base cost for this physical structure in early 2008 was $11.44 million, or $143.05 per square foot. This number was then adjusted across markets based on the location factors reported by the R.S. Means Company [2008]. Costs over time were computed using annual data from previous years, also reported in the firm's 2008 publication.[10]

For house prices, data from Glaeser, Gyourko, and Saiz [2008] were used based on the value of the median-quality home from the 2000 census in each metropolitan area. Construction cost data were from the R.S. Means Company [2008] for a 2,000-square-foot home of modest quality that just meets all local building code requirements.[11]

Housing and office data could be matched for the 32 metropolitan areas depicted in the plot in Exhibit 2 of the percentage changes from 2003 to 2008 in the ratio of price to construction cost for CBD office buildings and owner-occupied homes.[12] The simple correlation between the two series depicted in the graph is 0.47, with the underlying bivariate regression coefficient being 0.92 (standard error = 0.31). Nothing causal is implied here, of course, only that the statistical relationship is strong. It certainly indicates that if implied land values in the housing sector rose a lot during the recent boom in a given metropolitan area, they also tended to rise a lot in that area's office sector. Note that this is the case whether the market is thought to have a very elastic supply side (e.g., Phoenix and Tampa) or an inelastic one (e.g., Manhattan and Los Angeles). This pattern certainly is consistent with the use of a common factor, such as land, fostering similar outcomes across property sectors within the same market.

Although the housing and commercial property sectors are obviously closely related, some important differences exist. The commercial market has been much more volatile, on average, and often experiences sharp drops in nominal prices during busts. Longer lead times in the production of income-producing properties may help explain this. This volatility is great enough to generate nominal, not just real, price declines in commercial property prices during downturns. The plot of the real capital values of the NAREIT and FHFA series in Exhibit 3 depicts the co-movement in these series over time. The beginning value of each series is indexed to 100 in 1978, with the log FHFA value denoted by the year symbols and the log NAREIT value by the solid line. The positive correlation between these two series reported in Exhibit 1 is readily visible; and the REIT series is much more volatile.

The 1979–1981 downturn in equity REITs is the only downturn in which nominal prices of firms did not fall appreciably. Even though real prices of publicly traded owners of commercial properties declined by 20% during that time period, as shown in Exhibit 3, nominal values were flat because inflation was so high. Real prices then boomed by 48% before peaking in 1986. From 1986 to 1990, the commercial property markets collapsed, with real capital losses of −42%. Nominal losses over the same time period were about −30%. Over the 1990–1997 period, the real index rose by nearly 81%. Another bust occurred between 1997 and 1999, with real prices dropping by about −35%. Inflation was mild during this time period, so nominal price declines in the NAREIT index

EXHIBIT 2
Changes in Price to Construction Cost, 2003–2008

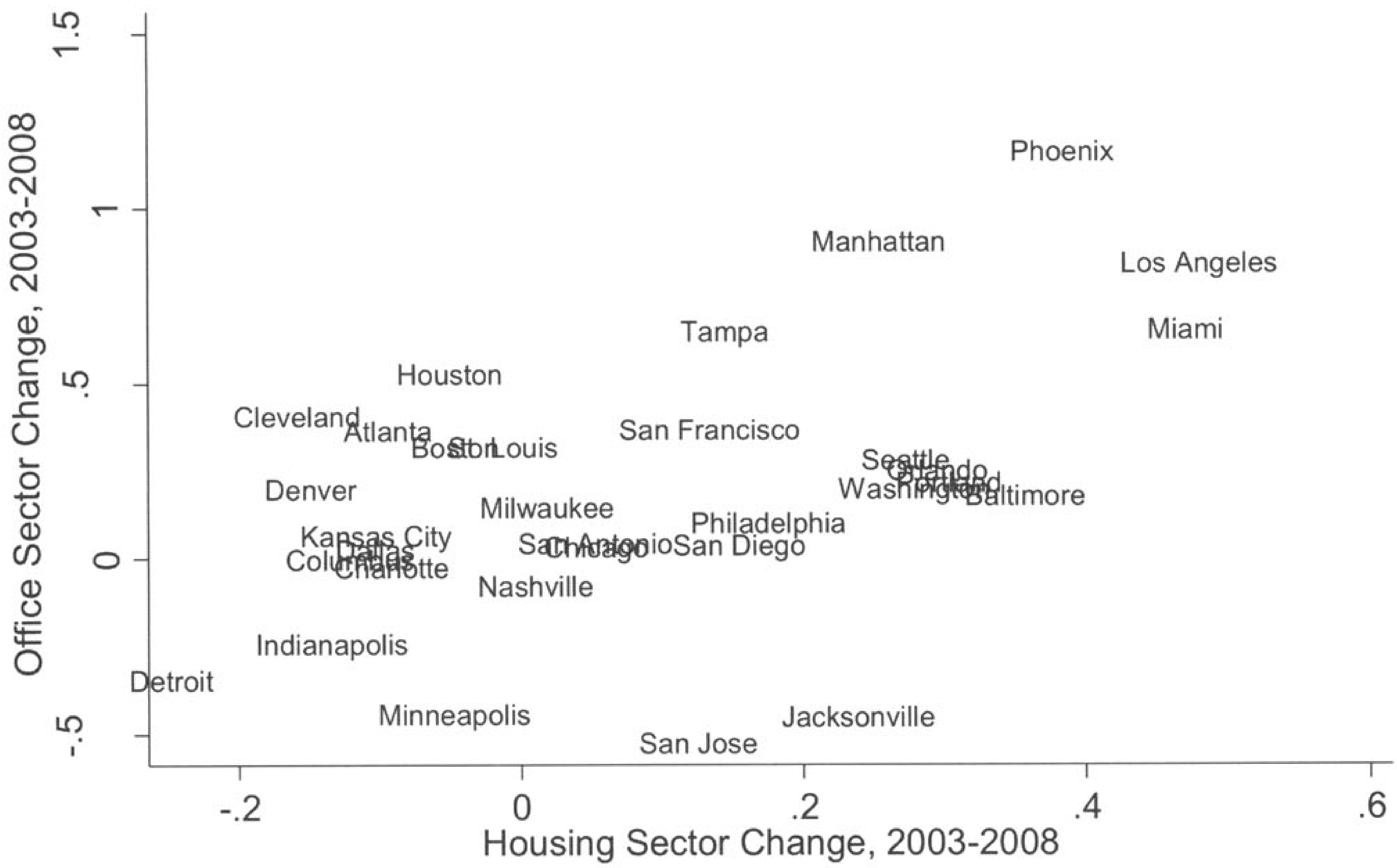
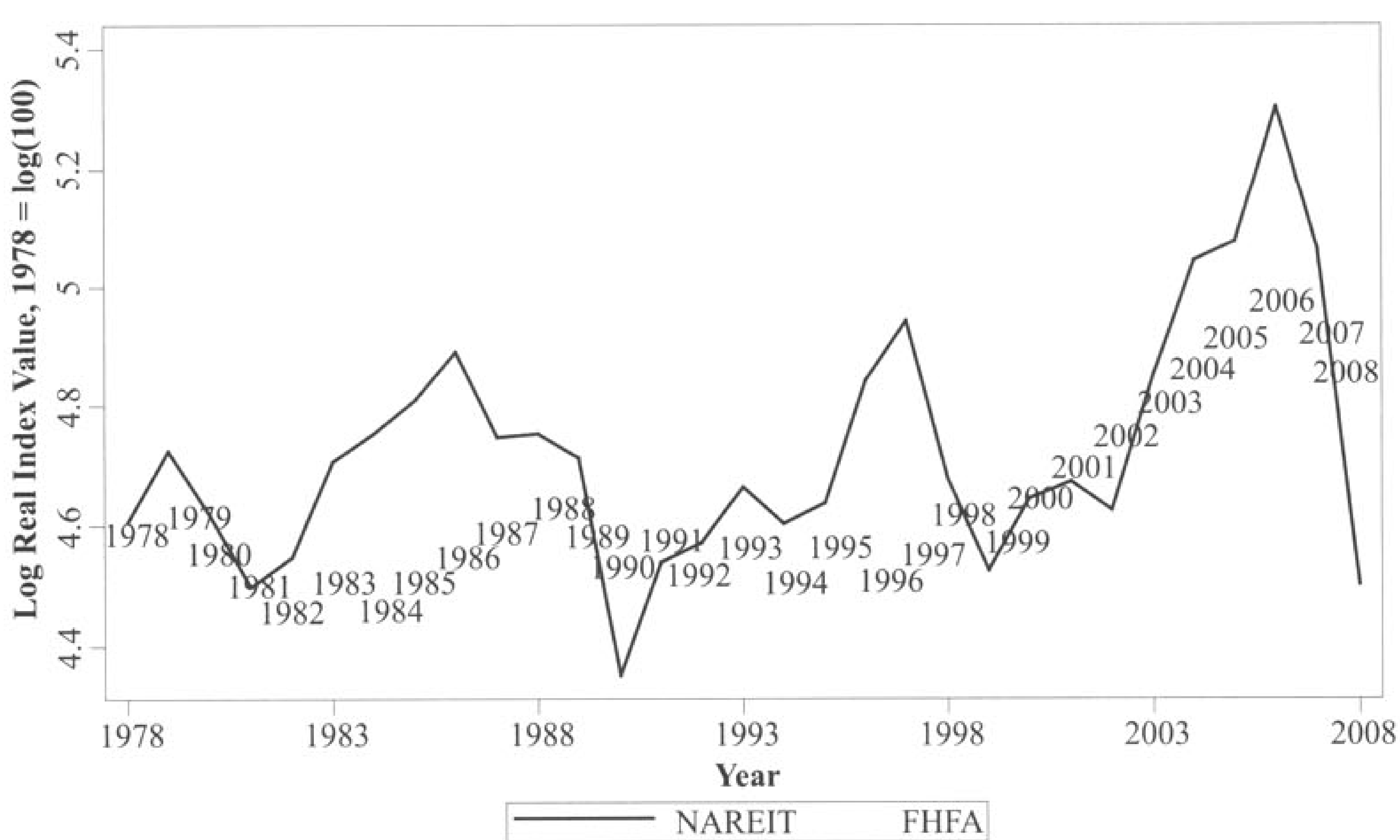


EXHIBIT 3
Commercial Real Estate and Housing, 1978–2008



were similarly large, at about −30%. A long and extraordinary boom then ensued, with public market prices growing by about 118% in real terms and by 164% in nominal terms between 1999 and 2006. The price component of the NAREIT series fell by nearly 20% in 2007 and then by another 41% in 2008. Total returns for 2009 are about −9% as this article is being written. Thus, real equity REIT prices are back to their 1978 levels, with the most recent downturn being the largest bust in the values of publicly traded real estate firms in history.

Although not depicted here, nominal declines in the capital values of the appraisal-based NCREIF series also occur in downturns; for example, this index experienced a 27% nominal decline following a peak in 1986. The timing of cycles is different due to appraisal lags in the two indices, so that adjustments must be made for the absence of leverage to make the NCREIF series more comparable to NAREIT. Over longer periods of time, however, they tell similar stories for asset values.[13]

As many people have noted, a nominal downturn in aggregate national house prices did not occur until 2008. Exhibit 3 documents, however, that real price declines did occur in the past. Real constant-quality house prices fell by 12% between 1979 and 1982 then rose by 13%, peaking in 1989. Another modest downturn in real prices—just over 6%—occurred between 1989 and 1994. The biggest boom in the history of the U.S. housing market then ensued with real constant-quality prices increasing by 53% through 2006. Nominally, house prices more than doubled—by about 114%. The most recent data from FHFA show nominal declines on an aggregate basis for the first time in the history of this housing series; the S&P/Case-Shiller data, which include sales on homes financed by subprime and Alt-A loans, exhibit much larger, double-digit declines.

In sum, these data provide no support for the hypothesis that weaker limits to arbitrage in the commercial property sector will lead to less volatility over the cycle. The recent extraordinary boom in owner-occupied housing was roughly matched by commercial real estate. There are differences across the sectors, but they are consistent with different supply conditions and varying business cycle impacts across the cycles. The similar medium- to longer-run outcomes in terms of price appreciation suggest that the common demand drivers predicted by the Rosen-Roback model of spatial equilibrium are dominant, on average. If so, we should see other similarities associated with those fundamentals, and it is to that issue we now turn.

RETURN PREDICTABILITY IN COMMERCIAL PROPERTY MARKETS

Given that commercial real estate cycles are of fairly long duration, covering multiple years, raises questions about the predictability of returns. We know from housing market research that price growth persists from one year to the next (Case and Shiller [1989]) and it mean reverts over longer horizons of five years or more (Glaeser and Gyourko [2008]). Mean reversion has been shown to be due primarily to shocks in local income, combined with, but to a lesser extent, lagged building responses. If the standard urban model is correct that both sectors are driven by the same demand fundamentals, then similar patterns should appear in the commercial sector.

To investigate this, we turn to NCREIF data for the 45 local markets listed in the appendix. Indices analogous to those reported in the previous exhibits for the nation are available on a consistent basis for each of the local markets dating back to 1985.[14] Unfortunately, equity REIT data cannot be used in the analysis as it is not feasible to consistently isolate cash flows and valuations by metropolitan area in the stock market information. Simple autocorrelation models are estimated over different horizons that control for national business cycle effects and local market trends using data not only on the capital appreciation index, but on the net rental income index and the total return series. Equation (1) describes the equation estimated,

$$\begin{aligned}\%\Delta\text{Index}_{i,t+j} - \%\Delta\text{Index}_{i,t} = {} & \text{Year}_t + \text{Metro}_i \\ & + \gamma(\text{Index}_{i,t-1} - \text{Index}_{i,t-1-j}) \\ & + \varepsilon_{i,j} \qquad (1)\end{aligned}$$

Exhibit 4 reports results for j equal to one-, two-, three-, and four-year horizons, with t representing years and i metropolitan areas. To avoid artificially inducing mean reversion in fixed effects regressions such as these, any overlap in the estimation period is avoided. Thus, for one-year horizons, price appreciation between periods t and $t + 1$ is regressed on lagged price appreciation between periods $t - 2$ and $t - 1$. We work with the quarterly NCREIF data to create one-, two-, three-, and four-year non-overlapping intervals. Only OLS was estimated because the short panel length made use of more sophisticated techniques, such as those introduced by Arellano and Bond [1991], not helpful in either a statistical or economic sense.

The top panel reports results for one-year horizons. There have been 19 non-overlapping horizons since 1985,

EXHIBIT 4

Time-Series Properties: NCREIF Real Appreciation, Income, and Total Return Indices

	Appreciation	Income	Total
	One -Year Investment Horizon $\%\Delta(\text{Index}_{i,t+1} - \text{Index}_{i,t}) = \text{Year}_t + \text{Metro}_i + \gamma\%(\Delta\text{Index}_{i,t-1} - \text{Index}_{i,t-2}) + \varepsilon_{i,j}$		
γ	0.24 $(0.06)^1$ $(0.04)^2$	0.44 $(0.05)^1$ $(0.04)^2$	0.25 $(0.05)^1$ $(0.04)^2$
R^2	0.66	0.91	0.66
nobs	810	810	810
	Two -Year Investment Horizon $\%\Delta(\text{Index}_{i,t+2} - \text{Index}_{i,t}) = \text{Year}_t + \text{Metro}_i + \gamma\%(\Delta\text{Index}_{i,t-1} - \text{Index}_{i,t-3}) + \varepsilon_{i,j}$		
	Appreciation	Income	Total
γ	0.10 $(0.09)^1$ $(0.05)^2$	0.23 $(0.11)^1$ $(0.05)^2$	0.10 $(0.08)^1$ $(0.05)^2$
R^2	0.73	0.91	0.74
nobs	405	405	405
	Three -Year Investment Horizon $\%\Delta(\text{Index}_{i,t+3} - \text{Index}_{i,t}) = \text{Year}_t + \text{Metro}_i + \gamma\%(\Delta\text{Index}_{i,t-1} - \text{Index}_{i,t-4}) + \varepsilon_{i,j}$		
	Appreciation	Income	Total
γ	–0.12 $(0.11)^1$ $(0.06)^2$	0.06 $(0.10)^1$ $(0.06)^2$	–0.12 $(0.10)^1$ $(0.06)^2$
R^2	0.73	0.91	0.74
nobs	270	270	270
	Four -Year Investment Horizon $\%\Delta(\text{Index}_{i,t+4} - \text{Index}_{i,t}) = \text{Year}_t + \text{Metro}_i + \gamma\%(\Delta\text{Index}_{i,t-1} - \text{Index}_{i,t-5}) + \varepsilon_{i,j}$		
	Appreciation	Income	Total
γ	–0.30 $(0.18)^1$ $(0.09)^2$	–0.13 $(0.17)^1$ $(0.08)^2$	–0.31 $(0.17)^1$ $(0.08)^2$
R^2	0.66	0.87	0.62
nobs	180	180	180

Notes: [1]Standard errors clustered by investment horizon; [2]standard errors clustered by market.

hence the 810 observations in this regression (45 metropolitan areas times 18 years). The positive coefficient of 0.24 in column one indicates that the one-percentage-point-higher appreciation rate last year is associated with a 0.24% higher appreciation rate this year, controlling for national conditions and the local trend. This is similar to the 0.2–0.5 coefficients reported for owner-occupied housing by Case and Shiller [1989]. Both property sectors exhibit short-run persistence, so that growth begets growth (and decline begets decline) across years in the housing and commercial property markets. Two sets of standard errors, one clustered by investment horizon length, the other by metropolitan area, are reported in parentheses. Even if clustering by investment horizons is thought to be appropriate, the estimated persistence remains statistically significant at the usual confidence level.

Net rents on buildings are even more persistent across years, as indicated by the 0.44 coefficient reported in column two of the top panel of Exhibit 4. The third column reports results for total returns that are very similar to those for the capital index, implying that the variation over time in total returns is essentially driven by volatility in the capital value series in the NCREIF data. Building rents do fluctuate, of course, but they are quite smooth compared to property values. This makes commercial real estate similar to stocks in the sense that total returns are driven more by changes in the multiple attached to rents (earnings) than by changes in the rents (earnings) themselves (Shiller [1981]).

The second panel of Exhibit 4 indicates that the persistence in appreciation rates, income growth, and total returns weakens rapidly. Over two-year horizons, the estimated γ coefficient on capital values falls to 0.10 and is not statistically significant if clustered by years. The income series remains persistent, with the coefficient falling by half to 0.23, but continuing to be statistically significant regardless of the clustering assumption.

The findings reported in the third panel show that no meaningful persistence remains and some evidence that capital values and total returns mean revert. The point estimate on appreciation is now negative at –0.12, but this result is only marginally statistically significant. Stronger evidence of mean reversion is reported in the bottom panel for four-year horizons. The appreciation index coefficient is –0.30, which implies that if the appreciation rate was one percentage point higher in, say, the 2004–2008 period, then it will be –0.3 points lower in the subsequent 2009–2112 period (always relative to national conditions and the local market trend). This result is highly significant if clustered by metropolitan area. The *t*-statistic when clustering by years is only –1.7, but with only four non-overlapping four-year horizons the test presumes only few degrees of freedom. It is also noteworthy that the coefficient on the income index turns negative over four-year horizons. This result is not statistically significant, but it is the first evidence that commercial rents, not just asset values, might mean revert over the medium term.

Estimations were also done for longer horizons and they typically yielded even more mean reversion. No semblance of statistical precision remains in these regressions, however, because of the limited number of non-overlapping intervals.

Even with the limitations of these data, it seems reasonable to conclude that commercial real estate appreciation, much like housing price growth, persists from year to year and then mean reverts over medium- to longer-term investment horizons. Investors can expect to give back one-quarter or more of any appreciation realized in excess of that warranted by national business cycle conditions and the local trend over four- to five-year horizons.

COMMON VERSUS LOCAL EFFECTS IN COMMERCIAL PROPERTY MARKETS

To see changes of the magnitude documented in the previous section for the aggregate national series requires some common movement across local markets. To investigate just how strong those common effects are, we turn again to the NCREIF data on local markets. In this case, fixed-effects regressions of the real annual appreciation rate, real growth rate in net rents, and real total returns in each market on year and metropolitan area dummies are estimated to document how much of the variation can be explained by each set of variables. Exhibit 5 reports the results. Each regression has 1,035 observations—45 markets with 23 years of data.

Common effects are large as indicated by the high R-squareds reported in the top panel of the exhibit. About 60% of the variation in real annual appreciation rates and real total returns can be explained by year dummies, with 85% of the variation in real annual income growth on these properties being common across markets. The middle panel of Exhibit 5 shows that market dummies account for less than 5% of the variation. The final panel reports explained variation when both time and market fixed effects are controlled for.

EXHIBIT 5

National vs. Local Market Effects-NCREIF Real Appreciation, Income, and Total Return Indices

	Common Effects Specifications: $\%\Delta \text{Index}_{i,t} = \alpha + \beta * \text{Year}_t + \varepsilon_{i,t}$		
	Appreciation	Income	Total
R^2	0.59	0.85	0.60
nobs	1,035	1,035	1,035
	Market-Specific Effects Specifications: $\%\Delta \text{Index}_{i,t} = \alpha + \beta * \text{Market}_i + \varepsilon_{i,t}$		
	Appreciation	Income	Total
R^2	0.03	0.04	0.02
nobs	1,035	1,035	1,035
	Common Plus Market-Specific Effects Specifications: $\%\Delta \text{Index}_{i,t} = \alpha + \beta * \text{Market}_i + \varepsilon_{i,t}$		
	Appreciation	Income	Total
R^2	0.62	0.88	0.62
nobs	1,035	1,035	1,035

These results are quite different from what Glaeser and Gyourko [2008] reported for the owner-occupied housing market. They found that year fixed effects could explain only 27% of the variation in real annual house price changes between 1980 and 2005 for 115 metropolitan areas. Thus, housing markets appear to be relatively local in nature, in the sense that appreciation is driven more by metropolitan-specific factors, while commercial real estate appears to be more of a national market, with nearly two-thirds of the variation in its asset values and total return explained by a common effect.

Why the commercial and owner-occupied markets differ so much in this regard is not well understood. It is possible that the commercial sector investor base is more national in scope and that debt and equity capital markets are more national and standardized across local markets than is the case for the housing sector. This difference between the two markets clearly merits future research attention, as it raises the possibility that macro variables will have more influence on commercial property than on owner-occupied housing values.

OTHER RISK FACTORS AND CHARACTERISTICS OF COMMERCIAL PROPERTY MARKETS

Several other risk factors and characteristics of commercial property markets are worthy of discussion: financial leverage, the components of office price appreciation, construction costs, and deterioration in underwriting quality.

Financial leverage. The combination of high financial leverage and substantial medium-term mean reversion in prices has potentially important implications for the credit risk of commercial real estate. A report by the Urban Land Institute (ULI), *Emerging Trends in Real Estate*, indicates that the aggregate leverage ratio for institutional-grade commercial real estate was three to one in 2008, which implies a 75% loan-to-value ratio. Although past publications indicate that this level of debt is typical for the sector, it seems likely that this overstates aggregate leverage in the industry because debt is easier to count. Debt is often issued by a regulated entity that must report the data or debt is securitized in a public form. Some private equity, particularly in smaller firms, probably is missed in the data collection effort. For example, some small firms took out modest-sized mortgages that were securitized in conduit programs; their debt is probably accurately measured, but their equity is likely understated in the ULI data, if not missed entirely.

An aggregate loan-to-value ratio of 50% is more typical of publicly traded real estate firms, although there is variation about that mean; one prominent highly leveraged company, General Growth Properties, has already filed for bankruptcy. In addition, life insurance companies typically do not issue commercial loans with loan-to-value ratios in excess of 70% to 75%. Lower leverage is also suggested by the NCREIF data. Returns on that index are computed as if the properties were acquired with cash, but over half had some debt as of the end of 2008. Of the properties with debt, the aggregate loan-to-value ratio was only 53%.[15] Reported leverage is even lower in some other data compiled by NCREIF. The open-ended diversified core equity funds that NCREIF tracks had a 27% aggregate loan-to-value ratio at the end of 2008.[16] Other information reported by NCREIF and The Townsend Group provide leverage data on different types of investment funds. The riskiest, so-called opportunity funds were estimated to have a 67% loan-to-value ratio at the end of 2008.[17] At least until quite recently, aggregate leverage in the commercial mortgage-backed securities (CMBS) market was lower than 75%. Downing, Stanton, and Wallace [2008] reported an average loan-to-value ratio at issuance of 67.4% for over 14,000 commercial mortgages used in securitizations between 1996 and 2005. The interquartile range of loan-to-value ratios ran from 63.3% to 74.7% in their data.[18]

More research is urgently needed to document the distribution of loan-to-value ratios, not just the aggregate mean. On average, the data suggest that normal reversion from the peak will wipe out much of the equity in the institutional-grade property sector. Recession effects only make the situation worse, which is foreboding for lenders, not just borrowers. The extent of mean reversion in this sector also suggests that both lenders and financial market regulators should rethink the wisdom of employing high leverage, especially during booms. Downpayments of less than one-quarter of property value look quite risky given the normal vagaries of this market.

Office price appreciation during the boom: Rent growth vs. multiple expansion. Just as stock price increases can be attributed to earnings increases or expansion in earnings multiples, commercial property price increases can be decomposed into two parts, one due to net rent (or cash flow) increases and one due to expansion of the multiple. In real estate, investors typically refer to the cap (or capitalization) rate on properties, which is defined as the ratio of net rents to property value. For those more familiar with stock market terminology, the cap rate can be thought of as the inverse of the price-to-earnings ratio. Hence, a lower cap rate indicates that investors are willing to pay a greater multiple on a given dollar of net rents from a property.

Using the same Real Capital Analytics data previously described, we find that cap rates on office buildings fell substantially in most markets. Exhibit 6 documents the distribution of office property cap rates at two points

EXHIBIT 6
Office Building Cap Rates, CBD and Non-CBD Areas, 2003 Q2 and 2008 Q2

	Non-CBD Areas		CBDs	
	2003 Q2	2008 Q2	2003 Q2	2008 Q2
Mean	0.09	0.07	0.09	0.06
Standard Deviation	0.01	0.01	0.01	0.01
25th Percentile Value	0.09	0.07	0.08	0.06
50th Percentile Value	0.09	0.07	0.09	0.06
75th Percentile Value	0.09	0.07	0.09	0.07

Source: Real Capital Analytics.

in time—2003 Q2 and 2008 Q2. In 2003 Q2, cap rates typically were a little lower in CBDs, but the difference was not large, on average, nor was this the case in all markets. Office buildings traded, on average, at a 9% cap (or at a multiple of price to net rents of 11.1) in 2003 Q2. Just over one-quarter of CBD areas had lower cap rates; for non-CBD areas, the analogous fraction was not much more than 10%. Cap rates fell in general between 2003 and 2008, with the average non-CBD cap rate falling to 7% and the average CBD cap rate dropping even further to 6%. Thus, net rent multiples expanded by one-quarter to one-third in most office markets between 2003 and 2008.

It is straightforward to decompose the overall change in price between 2003 and 2008 into a part due to rising net rents versus falling cap rates. The share attributable to rising net rents can be computed by discounting net rents in 2008 Q2 as a perpetuity using the cap rate from 2003 Q2, and then computing the implied price change as a share of the actual price change.[19] By definition, any remaining share is that due to falling cap rates.

EXHIBIT 7

Office Price Growth Decomposition, 2003 Q2–2008 Q2
14 CBD Areas, Prices Grew 20% > Construction Costs

Market Area	Nominal Price Growth, 2003–2008	Share Due to Rent Growth	Share Due to Cap Rate Compression
Atlanta	82%	34%	67%
Boston	77%	13%	87%
Cleveland	83%	78%	22%
Houston	105%	53%	47%
Los Angeles	146%	46%	54%
Miami	133%	53%	47%
Manhattan	147%	31%	69%
Orlando	80%	12%	88%
Phoenix	193%	56%	44%
Portland, OR	58%	45%	55%
St. Louis	76%	45%	55%
San Francisco	78%	21%	79%
Seattle	70%	26%	74%
Tampa	153%	68%	32%

Source: Author's calculations using the Real Capital Analytics office price data and the R.S. Means Company [2008] construction cost data.

Exhibits 7 and 8 report this decomposition for each market that experienced significant increases in prices of office buildings relative to their construction costs. To be on the list, office prices had to rise by 20%+ more than the rise in construction costs between 2003 and 2008. This cutoff is admittedly arbitrary, but is intended to ensure a focus on markets where it is highly likely that land prices really jumped.

Exhibit 7 lists the 14 (of a possible 32) CBD areas that met this requirement. Among this group, nominal growth in office prices was 106%, and prices rose relative to construction costs by 52%. On average, the share of price growth due to net rent growth was 41% versus 59% due to cap rate compression. This average does mask some important variation, as net cash flows grew enough in the Cleveland, Houston, and Phoenix CBDs to account for more than half of the very high price appreciation that occurred in those markets. Still, expansion in the multiple is more important than rent increases, on average, in explaining price appreciation in these high-growth central business districts.[20]

Exhibit 8 lists the 11 (of a possible 33) non-CBD areas where prices of office buildings rose by at least 20% more than construction costs rose. Not only is this a somewhat shorter list, but the price growth is lower, on average. Nominal office price growth averaged 83% among this group, with prices rising relative to construction costs by an average 41%.[21] The decomposition of that appreciation is split relatively evenly between rent increases and cap rate declines, although the mean also masks substantial heterogeneity across markets.

Explaining the large role that expansion in rent multiples played in the recent commercial property boom is another issue in need of serious research. Unfortunately, without much better data, nothing definitive can be said about whether any widespread mispricing in the office sector occurred. Because prices did not escalate significantly more than construction costs in about two-thirds of all markets, no glaring evidence exists that prices are "too high" in these places. This is not the case, however, for the places listed in Exhibits 7 and 8, which contain some of the biggest markets in the country, as well as many markets in Arizona, California, Florida, and Nevada, where housing boomed

EXHIBIT 8

Office Price Growth Decomposition, 2003 Q2–2008 Q2
11 Non-CBD Areas, Prices Grew 20% > Construction Costs

Market Area	Nominal Price Growth, 2003–2008	Share Due to Rent Growth	Share Due to Cap Rate Compression
Atlanta	97%	68%	32%
Baltimore	78%	47%	53%
Charlotte	162%	66%	34%
Columbus, OH	28%	121%	–21%
Jacksonville, FL	52%	14%	86%
Las Vegas	68%	32%	68%
Los Angeles	79%	28%	72%
San Antonio	70%	9%	91%
San Diego	99%	52%	48%
San Francisco	111%	53%	47%
Palm Beach	71%	56%	44%

Source: Author's calculations using the Real Capital Analytics office price data and the R.S. Means Company [2008] construction cost data.

the most and is now busting the most. This raises a suspicion that mispricing of a common factor, such as land, occurred across property types in these areas.

Large price increases beyond those warranted by production costs outside of CBDs, where supply probably is more elastic, are the most obvious signals of potential mispricing. Minimum profitable production costs (MPPC) can be defined as the sum of physical construction costs, land and land assembly costs, and the developer's normal profit. As long as demand is sufficient to pay those costs, new supply should keep market prices close to MPPC, yet implied land values have jumped in the places listed in Exhibit 8. Rising land values could still be justified if supply became more inelastic in these areas, perhaps because of the adoption of more-stringent building controls. Unfortunately, no consistent data are available on the flow supply of office space within a metropolitan area, so we cannot conclude that irrational exuberance of the type Shiller [2005] claimed for housing developed in other property sectors.

It is even harder to interpret the price increases experienced within the CBDs listed in Exhibit 7. One of the oldest literatures in urban economics suggests there will be scarcity value to land in the urban core that could well be growing over time (Alonso [1964]; Mills [1967]). The fact that the implied compound annual price increases tend to be in excess of 10% suggest, however, that it will be difficult to account for them by normal demand growth, even assuming a fixed supply. True fundamentals rarely escalate at double-digit levels for such long periods of time.

The Rosen-Roback model of spatial equilibrium provides some insight into this matter, even for these markets. One of the model's key underlying assumptions is that a reference market is always available to workers and firms that provides a baseline level of utility for workers and a baseline level of profits for firms. Further, residential and commercial buildings always can be supplied at their respective MPPCs in the reference market. Equal profits (or utility) across markets is consistent with both higher wages and land prices in, say, Manhattan than in the reference market, if workers or local amenities are more productive. Urban economists long have viewed the consistently high land values in CBDs, such as Boston, New York, and San Francisco, as partially reflecting persistently higher productivity of the local workforce. This certainly is plausible given large agglomerations of highly skilled finance and tech workers in these markets.

Whether a greater productivity differential developed between, say, Manhattan and the reference market over the last five years sufficient to justify the greater implied gap in land prices is another question entirely. Until quite recently, it plausibly could have been argued that Manhattan had become more productive because of its innovation in financial products. Now, fewer people would agree, as it is beginning to look as if increasing leverage on many of the same low-margin business lines drove increased profitability in the financial sector. If so, this market's recently much higher relative land values should be viewed with suspicion, as spatial equilibrium requires a permanently higher productivity differential (or an increase in relative amenity values) to maintain the greater land price differential with respect to the reference market.

Underwriting quality deterioration. A number of signs indicate that lenders, not just owners, became more optimistic during the boom. One such sign is the deterioration in underwriting quality in recent years. For example, data from a variety of Moody's research reports show that, for transactions rated by the firm between 2003 and 2007, the fraction of conduit loans with either partial or full interest-only periods skyrocketed from less than 10% to nearly 90%. Thus, lenders to commercial property owners, not just those to home owners, appear to have falsely concluded that asset values always rise, so that building equity the old-fashioned way via amortization was no longer needed.

Not only did loan terms ease, but more aggressive cash flow assumptions that credited prospective rental increases in lieu of in-place income became more widespread. These so-called pro forma loans totaled more than $40 billion according to one recent report. The pro forma moniker arises because the loan amount and terms were based on prospective rents, not actual in-place rents. One CMBS market data provider, Trepp, estimates that these loans constituted at least 10% of all commercial mortgages securitized in 2007 (Mulholland [2008]).

In addition, subordination levels, which represent the value that must be lost before a given bond tranche is impaired, declined substantially over time. Gyourko [2008] showed that some investment-grade tranches from 2006 had subordination levels below the peak delinquency rates reached in the last major real estate downturn in the early 1990s.

Construction costs. Another interesting feature of the property markets is how construction costs have changed over time. The R.S. Means Company data show that the real physical cost of construction for the suburban office building discussed earlier declined for a decade from the early 1980s through the early 1990s. It then remained flat for another 10-year period, before rising sharply beginning in 2004 and 2005. Since then, real construction costs have increased about 20%, offsetting previous declines, leaving such costs at their highest point in the last 25 years.

In contrast, the real cost of producing most durable goods (on a constant-quality) basis has fallen over time, making real estate an exception compared to manufacturing. Whether real construction costs will mean revert is unknown. Sensible arguments are being made on both sides.[22] The answer is important because of its implications for property values. Given that land typically does not amount to more than 20% of total property value in markets without stringent building restrictions and that normal gross profits for developers are 15% to 20%, the cost of putting up the physical structure amounts to 65% to 75% of overall property value in a market with modest development restrictions.

Thus, every 10-percentage-point decline in construction costs lowers minimum profitable production costs by about 7%. If the recent 30% nominal increase in building costs turns out to be temporary, and costs mean revert to their levels from the turn of the century, builders could earn normal profits on buildings that are priced 15% to 20% below today's levels in elastically supplied market areas; that is a boon for those wanting to purchase property, but not for current owners or those who financed them.

CONCLUSIONS

The data indicate that appreciation in owner-occupied housing and income-producing property markets within the same metropolitan area behave quite similarly over time. They move together contemporaneously and have similar time-series patterns. Commercial property market cycles are more volatile. This is consistent with basic location theory in urban economics and with the use of common factors, such as land, capital, and production technologies, which helps lead to similar results across real estate sectors within the same market area.

The analysis of various risk factors finds that investor and lender optimism in the income-producing sector was not all that different from the optimism that occurred in the housing sector. In the office markets that experienced the largest value increases relative to fundamental production costs, most of the price increase is due to falling cap rates (i.e., rising net rent multiples), not rent increases themselves. Investor optimism was shared by lenders, too, as evidenced by how underwriting standards were relaxed during the boom. This appears to have left the commercial property sector with relatively weak capital structures. When combined with strong mean reversion, this could raise further problems for the health of the banking system, while it provides opportunities for new investors.

APPENDIX

Metropolitan Areas in NCREIF Data

1. Atlanta
2. Austin
3. Baltimore
4. Bethesda (CBSA Division)
5. Boston (CBSA Division)
6. Cambridge (CBSA Division)
7. Camden (CBSA Division)
8. Charlotte

9. Cincinnati
10. Columbus, OH
11. Dallas (CBSA Division)
12. Denver
13. Detroit (CBSA Division)
14. Ft. Lauderdale (CBSA Division)
15. Ft. Worth (CBSA Division)
16. Hartford
17. Houston
18. Indianapolis
19. Jacksonville, FL
20. Kansas City
21. Los Angeles (CBSA Division)
22. Memphis
23. Miami (CBSA Division)
24. Milwaukee
25. Minneapolis
26. Nashville
27. New York
28. Oakland (CBSA Division)
29. Orlando
30. Philadelphia (CBSA Division)
31. Phoenix
32. Portland
33. Sacramento
34. St. Louis
35. Salt Lake City
36. San Antonio
37. San Diego
38. San Francisco (CBSA Division)
39. San Jose
40. Santa Ana (CBSA Division)
41. Seattle (CBSA Division)
42. Tampa
43. Virginia Beach
44. Washington, DC (CBSA Division)
45. West Palm Beach (CBSA Division)

ENDNOTES

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[1]For details, see the May 26, 2009, press release available at http://www2.standardandpoors.com/spf/pdf/index/CSHomePrice_Release_052619.pdf.

[2]Firm returns have fallen by about 60%, on average, but the 40%–50% leverage typical of this part of the industry implies that underlying property values declined by about half that amount. These figures apply only to equity REITs that own and operate income-producing properties.

[3]The terms commercial and income-producing real estate are used interchangeably in this article. To be income producing, the property cannot be owner occupied. The *institutional-grade* market open to investors was estimated to be worth $4.8 trillion in 2008 (Urban Land Institute and PricewaterhouseCoopers LLP [2008]). This is far smaller than the $15.9 trillion of real estate reported in the Federal Reserve Board *Flow of Funds Statistics* as being on the balance sheets of corporate and noncorporate businesses and other entities. Most of that property is owner occupied. Our focus is on the investable base that is rented out to third-party tenants.

[4]The user-cost model is financially oriented and relies on the implications either of no net benefit to owning versus renting on the margin or of no net benefit to being an investor/landlord versus an owner/occupier. Poterba [1984] was credited with introducing this framework into mainstream economics. At its simplest, this approach leads to the following equation that defines the price-to-rent ratio as a function of the various components of the user cost of occupying one's home for one period: $P(t)/R(t) = 1/[(1 - \tau)(r + \rho) + \delta - \alpha]$, where $P(t)$ represents house price in period t, $R(t)$ reflects rent that same period, τ is the marginal income tax rate, ρ is the property tax rate, r is the relevant interest rate, δ reflects true maintenance and depreciation on the home, and α is the expected home price appreciation rate. The precision with which prices can be predicted obviously depends upon the accuracy with which one knows the values of R, τ, ρ, δ, and α, along with there being no unobserved factors that materially affect the user cost.

[5]The data is available and may be downloaded at http://www.reit.com/IndustryDataPerformance/FTSENAREITUSRealEstateIndexHistoricalValu/tabid/78/Default.aspx.

[6]These data are available to members at https://www.ncreif.org/private/download.phtml?report=38.

[7]The TBI can be downloaded at http://web.mit.edu/cre/research/credl/tbi.html.

[8]This index was previously known as the Office of Federal Housing Enterprise Oversight (OFHEO) series. These data are available at http://www.fhfa.gov/Default.aspx?Page=87.

[9]See R.S. Means Company [2008, p. 178] for a picture of this building.

[10]Unfortunately, the location factors do not differ across property types within the same metropolitan area. Hence, the cross-sectional variation in construction costs is the same for both property types, with measurement error observable in land prices in the same way. This is not believed to be a major influence, but it will cause the sectors to move together to some extent.

[11]The data provider collects costs for different quality houses. The reference unit used here is for the lowest quality single-family home that meets all building code requirements. The results of the analysis are unaffected if a different quality home is chosen. See Glaeser, Gyourko, and Saiz [2008] for more detail on physical construction costs for houses.

[12]Geographic matching was done as closely as possible, but is not perfect in all cases. For example, Real Capital Analytics restricts its CBD office price data to Manhattan, not the entire city of New York. In all cases, office sector data were matched with house price and cost data for the metropolitan area. There also are timing differences between when prices are measured relative to construction costs for housing versus offices. For reasons having to do with differences in the timing of the release of the Real Capital Analytics office price data, the R.S. Means Company construction cost data, and the house price data taken from Glaeser, Gyourko, and Saiz [2008], a one-year lag of the housing sector data was compared with current office sector data. Essentially, this means that Exhibit 2 plots the percentage change in the ratio of price to construction cost in the office sector between 2003 and 2008 versus that of the housing sector between 2002 and 2007. Finally, the relationship is somewhat weaker if data on suburban office buildings is used. The simple correlation falls to 0.31, and the relevant regression coefficient is 0.44 (standard error = 0.24).

[13]Capital indices are being tracked because that is all we observe for owner-occupied housing. Total returns on commercial real estate are much stronger over time because of a consistently positive net rental flow. The compounding effect of that component is significant as the plots of total returns in Gyourko [2009] show.

[14]To be included in this list, continuous data must exist since 1985. Note that we include components of the largest, consolidated metropolitan areas (noted as CBSA Divisions in the appendix). Thus, the Oakland and San Francisco CBSAs are counted as separate markets in this analysis. This approach is certainly debatable. The NCREIF designations of individual markets are followed throughout, but readers should keep this issue in mind when thinking about the true degrees of freedom in the statistical analysis. In addition, pre-1985 data are available for a few markets, but we chose the 1985 start date for consistency. No results were altered by this choice. More important is the fact that the number of properties in each market tends to be small in the 1980s. For example, the mean number of properties across the 45 metropolitan areas is 18.7 in 1985, with 21 areas having less than 10 properties. The metropolitan area property counts have grown over time so that the smallest market had 11 properties in 2008, with the mean property count being 101 that year. Naturally, these are not constant quality series either.

[15]Loan-to-value data on the NCREIF Index is available in their National Property Trends Spreadsheets, which members may download at https://www.ncreif.org/private/download.phtml?report=6.

[16]See the report entitled NCREIF Fund Index Open-End Diversified Core Equity (First Quarter 2009), which is available free to NCREIF members at https://www.ncreif.org/pdf/member_files/nfi_odce_detail_rep_2009_Q1.pdf.

[17]See the report entitled *Real Estate Fund Indices and Vintage Period Performance Report (Fourth Quarter 2008)*, which NCREIF members may download at https://www.ncreif.org/pdf/NCREIF_Townsend_Fund_Indices_4q08.pdf.

[18]See the notes to Exhibit 3 in Downing, Stanton, and Wallace [2008] for more details.

[19]This is a standard use of cap rate data in the real estate industry. Recall that the cap rate, c, is defined as the ratio of net rents, NR, to asset price, P, or $c = NR/P$. Using data on c and P from Real Capital Analytics, implied net rents can be computed. That number for the second quarter of 2008, which reflects any increase since the second quarter of 2003, was then discounted as a perpetuity using the cap rate from the second quarter of 2003.

[20]This leaves 18 CBD areas in which prices did not rise by at least 20% more than construction costs during the recent boom. The markets are Baltimore, Charlotte, Chicago, Columbus (OH), Dallas, Denver, Detroit, Indianapolis, Jacksonville, Kansas City, Milwaukee, Minneapolis, Nashville, Philadelphia, San Antonio, San Jose, and Washington, DC.

[21]The 22 non-CBD market areas in which prices did not escalate sharply relative to construction costs include Austin, Boston, Chicago, Cleveland, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Miami, Milwaukee, Minneapolis, Nashville, Orlando, Philadelphia, Phoenix, Portland (OR), St. Louis, San Jose, Seattle, and Tampa.

[22]One argument is that on-going economic growth by large-population economies, such as India and China, will stress the supply–demand balance for natural resources, including some used in building construction. A counter argument is that production capacity for these materials will rise, thereby reducing the pressure on prices from growing demand.

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