The Commercial Real Estate Ecosystem

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Discussion by

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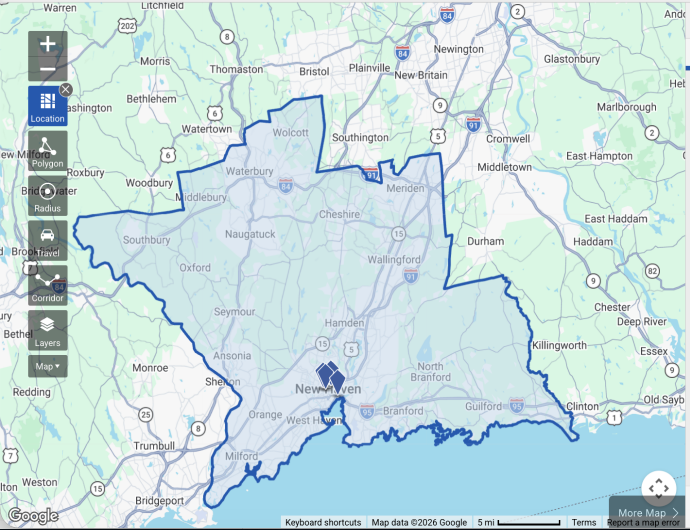
May 19th, 2026

New Haven - CT (USA) | Office | After 1/1/15 | Size | Clear | Filters 9 | Sort | Save | Reports | More | MAP | LIST | ANALYTICS



Search | Location

Primary | Building | Sale | Capital | Tenants | Contacts | Funds | More

Sale Date
After 1/1/15

CoStar Rating

Sale Price
$ Min | $ Max

Sale Price/SF
$ Min | $ Max

Include Undisclosed Sale Price

Cap Rate
Min % | Max %

Sale Status
- [x] Sold
- [ ] Under Contract
- [ ] For Sale

Property Type
Office

Property Size
Select

Secondary Type
Select

Sale Type
Investment | Owner User

Show Criteria | Analytic Filters | Clear | Done

New Haven - CT (USA) | Office | After 1/1/15 | Size | Clear | Filters 9 | Sort | Save | Reports | More | MAP | LIST | ANALYTICS

Sale Comps | Buyers | Sellers | Buyer Brokers | Listing Brokers | Lenders

Address	City	State	Property Type	Size (SF)	Rating	Sale Price	Price/SF	Sale Date	Sale Status
545 Long Wharf Dr	New Haven	CT	Office	250,000	★★★★☆	$14,000,000	$56.00	1/16/2026	Sold
545 Long Wharf Dr	New Haven	CT	Office	250,000	★★★★☆			11/1/2024	Sold
55 Park St	New Haven	CT	Office	146,000	★★★★☆	$101,150,000	$692.81	5/24/2023	Sold
545 Long Wharf Dr	New Haven	CT	Office	250,000	★★★★☆	$12,200,000	$48.80	1/10/2020	Sold
100 College St (Part of a 20 Property P...	New Haven	CT	Office	495,429	★★★★☆			9/1/2016	Sold
100 College St (Part of a 173 Property ...	New Haven	CT	Office	495,429	★★★★☆			1/27/2016	Sold
195 Church St	New Haven	CT	Office	245,000	★★★★☆	$18,250,000	$74.49	11/23/2015	Sold

This paper: new descriptives + framework to study CRE

- **Fundamental problem of CRE:** heterogeneous valuations even within well-defined market segments (e.g., Washington, D.C., CBD, A+ office)
  - Relatively illiquid assets $\implies$ difficult to obtain tight set of sales comps
  - Internally consistent valuations for underwriting (pro forma) may not reflect true mkt value
- **Approach in this paper:** propose a directed search model to decompose role of standard hedonic vs. *investor characteristics* for prices and deal volume
- Descriptive analysis highlights many things that are "common sense" to practitioners but which were not empirically documented beyond case studies or submarkets
- Two pieces to my discussion:
  1. Quick summary of framework + empirical findings (dense appendix)
  2. Comments/suggestions mainly on extending practical applications

What empirical facts do we learn about CRE markets?

1. **CRE prices depend on who trades, not just what trades**
   - Adding investor characteristics to a rich nonlinear hedonic model raises explanatory power by 10–20 R^2 points across sectors, with OOS R^2 of 81-85%
2. **Assortative matching on size of building and size of the investor**
   - Small investors tend to buy smaller assets, more local concentration
   - Reminiscent of results from the CEO pay literature (e.g., Gabaix & Landier 2008)
3. **Investor types specialize in different kinds of risk**
   - REITs: newer, higher-occupancy buildings $\longrightarrow$ stabilized yield, prohibitions on "flipping"
   - PERE funds: older, lower-occupancy assets with more upside potential $\longrightarrow$ IRR
4. **Marginal buyers can have large effects on asset prices, spatial demand**
   - Example: foreign buyers pushed up Manhattan A+ office prices by 4-5%

- And many more smaller facts in Appendix A on investors' tilt and buyer/seller pair types

Some wisdom from a practitioner

To paraphrase a guest speaker from my MBA CRE Investing course...

"What I like about real estate is that any two of us can go visit a building and see different opportunities."

Model: heterogeneous beliefs + directed search

To paraphrase a guest speaker from my MBA CRE Investing course...

"What I like about real estate is that any two of us can go visit a building and see different opportunities."

- Model takes this notion very seriously by incorporating heterogeneous investor beliefs into hedonic framework:

$$v_{it}(n) \equiv \ln V_{it}(n) = h\Big(\underbrace{z_{it}}_{\text{Investor characteristics}} , \underbrace{x_{nt}}_{\text{Property characteristics}} , \underbrace{\gamma_t}_{\text{Time-varying parameters}} \Big) + \underbrace{\varepsilon_{it}(n)}_{\text{Unobserved factors}}$$

- Microfound with simple two-period setup with mean-variance preferences + quadratic CAPX adjustment costs + Koijen & Yogo (2019) demand system

- Depart from random search by allowing buyer-seller meeting prob. to load positively on:
  1. Investor size (λ_1), portfolio span (λ_2), homophily (λ_3), relationships (λ_4)
  2. Portfolio tilt (λ_5) on size, market, sector, and quality specialization

Comment #1: what gives rise to investor disagreement?

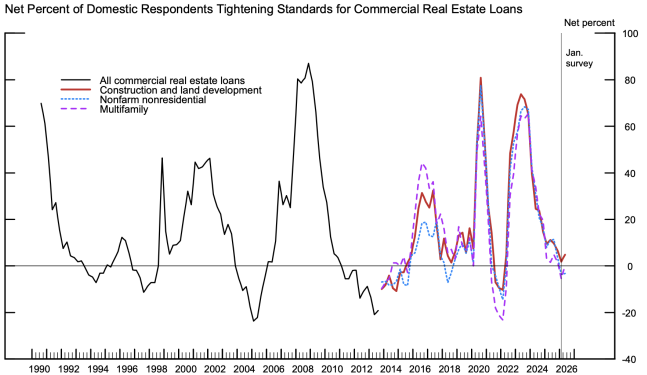
- **Some disagreement may be efficient**
  - Investors have different operating technologies, tax positions, mandates
  - A REPE fund may genuinely create more value from a distressed office than a REIT
- But some disagreement may reflect **market failures**
  - Investors may hold biased beliefs about future rents, cap rates, or exit values
  - They may extrapolate from recent ΔP (Glaeser & Nathanson 2017; Liu & Palmer 2026)
- We probably don't live in a Modigliani-Miller world
  - Cheap debt can make some investors appear to have high valuations
  - Tight credit can force other investors to sell below fundamental value
- Paper is agnostic about source of disagreement $\longrightarrow$ next step is to distinguish efficient heterogeneity from mispricing and market frictions

Comment #2: clarifying the role of financing

To paraphrase a guest speaker from my MBA CRE Investing course...

"Leverage is the drug of choice in commercial real estate."

- But maybe not so much over the last few years...



Source: Federal Reserve Board, April 2026 Senior Loan Officer Opinion Survey on Bank Lending Practices

Financing constraints are bundled in with investors' preference shocks

- Debt terms, lender relationships, **refinancing risk**, and interest-rate exposure can move bids (Firestone et al. 2024 FEDS; Chen & Chen 2025 on rollover risk)
- Investor types face different financing frictions
  - REITs face public-market discipline and NAV discounts
  - PERE funds face fund-life clocks and dry-powder pressure
- GFC, COVID, and the 2022–23 rate cycle were financing shocks
  - Their effects likely interact with buyer identity $\longrightarrow$ violation of the conditional independence assumption in their framework
- Model would be stronger with explicit credit state variables and financing interactions
  - Merge in with Trepp and "let the data speak" by checking whether leverage factors have high incremental R^2

Comment #3: lessons for practitioners

- Framework is powerful, but current counterfactuals are mostly about market structure
- Develop counterfactuals to stress test a pro forma or underwriting model

1. **Replace a single exit cap rate with an exit-buyer distribution**
   - Who is the marginal buyer at exit?
   - How deep is the buyer pool?
   - How much does value fall if the top $x\%$ of potential buyers disappear?
2. **Stress test financing conditions (not in this model yet)**
3. **Stress test liquidity: probability of sale within 6, 12, or 24 months**
   - Price discount required to transact quickly
4. **Stress test the business plan**
   - NOI/NER miss, delayed lease-up, CAPX overrun, lower exit quality
   - Which buyer types remain in the market under each scenario?

Probably a broken record but...

- Lots of other interesting applications of this framework to problems in CRE
  - Framing of paper is that approach applies more generally to private value assets...does it?
- Other applications within CRE...
  1. **Site selection**/forecasting excess demand for space
     - ⋆ Relative to off-the-shelf variables like building permits (Cortes & LaPoint 2024), college-educated worker population growth, rent-price ratios
  2. Identifying emerging property subtypes like data centers, memory care/senior housing, experiential real estate $\longrightarrow$ more scope for disagreement
  3. Sorting investors by **cap rate spread** rules (REITs) or target IRRs (PERE funds)
  4. Identifying in-the-money **Opportunity Zone 2.0 investments**
     - ⋆ Important issue given that current maps set to expire at end of 2026

Comment #4: better valuation model, or better data?

- Authors have incredibly comprehensive data (RCA + NCREIF + Compstak), but final sample still only possible through some (very carefully done) imputations
- Issue with imputing NER through matching properties between Compstak (lease level) and RCA (transaction level)
  - For $\approx$ 80% of properties impute NER at property-level rather than finer geographic level or RCA property index level (Table A.2)
  - **Interpretation:** NER is a new local macro char. that proxies for submarket quality
- There is a large literature on hedonic modeling and longstanding debate about best practices vis à vis **repeat sales** approaches
- **To highlight contribution of ML methods in valuation should:**
  1. Sharpen baseline valuation model or benchmark against repeat sales (or matching estiamtor approach of McMillen 2012 *REE*)
  2. Show extent to which superior performance of LGBM is function of superior CRE data?

Table B.1: Reference Point: Linear Hedonic Model

	Apartment		Industrial		Office		Retail	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CBD Indicator	0.061	0.165**	0.427***	0.288***	0.272***	0.105**	0.425***	0.269***
	(0.129)	(0.060)	(0.068)	(0.060)	(0.093)	(0.049)	(0.095)	(0.052)
Age	-0.064***	-0.078***	0.015*	0.001	-0.013	-0.030***	0.010	-0.004
	(0.010)	(0.009)	(0.009)	(0.007)	(0.008)	(0.007)	(0.007)	(0.006)
Renovation Adj. Age	-0.054***	-0.033***	-0.104***	-0.092***	-0.095***	-0.078***	-0.108***	-0.104***
	(0.013)	(0.007)	(0.012)	(0.010)	(0.012)	(0.011)	(0.009)	(0.009)
Property Size	-0.197***	-0.091***	-0.370***	-0.266***	-0.268***	-0.221***	-0.395***	-0.369***
	(0.024)	(0.021)	(0.016)	(0.015)	(0.021)	(0.021)	(0.015)	(0.014)
Property Subtype	0.138***	0.145***	0.160***	0.129***			-0.015	0.027
	(0.048)	(0.027)	(0.030)	(0.020)			(0.024)	(0.025)
No. of Floors	0.203***	0.120***	0.064**	0.023	0.139***	0.097***	0.198***	0.059***
	(0.024)	(0.017)	(0.030)	(0.021)	(0.016)	(0.010)	(0.024)	(0.020)
Occupancy Rate	1.031***	0.709***	0.174**	0.162***	0.974***	0.835***	0.591***	0.568***
	(0.193)	(0.140)	(0.067)	(0.038)	(0.073)	(0.052)	(0.074)	(0.055)
Superstarcity	0.561***		0.400***		0.520***		0.416***	
	(0.092)		(0.111)		(0.077)		(0.075)	
Entity Sale	0.270**	0.220**	0.142	0.118	0.161	0.140	-0.020	0.044
	(0.106)	(0.091)	(0.098)	(0.094)	(0.109)	(0.090)	(0.119)	(0.109)
Distressed	-0.498***	-0.229***	-0.466***	-0.226***	-0.447***	-0.292***	-0.350***	-0.276***
	(0.048)	(0.029)	(0.048)	(0.032)	(0.035)	(0.033)	(0.043)	(0.040)
Market Occupancy		0.094		-0.140		0.217*		0.006
		(0.306)		(0.091)		(0.117)		(0.091)
NOI Growth		0.073		0.013		0.027		-0.069
		(0.093)		(0.046)		(0.033)		(0.043)
Personal Income		0.603***		0.288***		0.359***		0.431***
		(0.071)		(0.066)		(0.052)		(0.031)
Population/Employment		0.025*		0.019		-0.027**		0.038***
		(0.013)		(0.013)		(0.012)		(0.006)
NER		0.043***		0.224***		0.446***		0.173***
		(0.007)		(0.033)		(0.062)		(0.033)
Year FE	×	✓	×	✓	×	✓	×	✓
Market FE	×	✓	×	✓	×	✓	×	✓
Observations	141,135	141,135	116,737	116,737	96,139	96,139	114,223	114,223
Adj. R^2	41.1	59.2	44.7	58.5	34.4	48.0	51.7	58.4

- Reference model has surprisingly low R^2 of 48%–59% even within segment and within market
- Use a more semi-parametric hedonic model as benchmark
  - (e.g., age/size bins, no. of floors as dummies)
  - Closer to what researchers do
  - Probably would reduce your gains relative to the LGBM

Example from a recent hedonic CRE price regression

D.C. CMBS Office Property Hedonic Regression (Choi & LaPoint 2025)

Variable	**Coefficient**	**Std. Error**	t-**Stat**	p-**Value**
Rentable Building Area ('000s sq. ft.)	0.0023***	0.0009	2.67	0.009
Property Age at Appraisal	-0.0206**	0.0082	-2.52	0.013
Property Age at Appraisal Squared	0.0001*	0.0001	1.66	0.098
Building Quality/Class FEs (CoStar)	✓			
Building Form/Vertical Scale FEs	✓			
Valuation-Year Market Condition FEs	✓			
# Properties	133			
Adj-R^2	**0.760**			

Notes: Dependent variable is the natural logarithm of property value. Rentable area is expressed in thousands. Regression results are estimated using the sample of Washington, D.C. Trepp properties with non-missing covariates. Robust standard errors are clustered at the property level. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

- Check with securitization values, alternative "quality" indices such as CoStar ratings scale

Side point on data: perpetual inventory approach

- Use **perpetual inventory approach** to construct investors' portfolio values
- Standard way to do this using something like Compustat:

$$RE^{j}_{i,\tau+1} = (1-\delta_j) \times RE^{j}_{i,\tau} \times P_{j,\tau+1}/P_{j,\tau} + \Delta GBRE_{i,\tau,\tau+1}$$

- Book-to-market correction using RCA nominal price indices adjusted using CPI-U
- Compute $\Delta GBRE_{i,\tau,\tau+1}$ by linking unique owners across transaction chains, up to level of parent entity i
- Standard approach, but requires some assumptions which are not spelled out:
  - What is (economic) depreciable asset life here? $\longrightarrow$ can estimate directly by mkt segment
  - Not many good estimates of CRE depreciation $\longrightarrow$ **LGBM might be useful here**
  - What goes into the price index $P_{j,t}$?

Miscellaneous suggestions/questions

1. When computing hedonic models, allow for **time-varying coefficients** β_t on the factors
   - Example: $\delta_t \times$ NER would pick up secular flight to quality phenomenon in office

2. Seems worth emphasizing that across all property segments, **can reject the null hypothesis of random search:** $H_0 : \lambda_i = 0, \forall i$
   - Report F-stat of joint significance of λ_i in Table 3
   - If group rural markets into one bucket, do we get closer to the random search benchmark?

3. **Table 4 (2006-07 counterfactual buyer tilt) is confusing to read**
   - Put buyer types in same order so easier for reader to compare across counterfactuals
   - Seems like model has trouble matching foreign buyer share...why?
   - Relatedly, in Figure 12, model has hard time matching psf during 2006-07

4. **Does multifamily only include securitized properties**, as these are the ones for which you can impute NER by unit? (App. A.3)

My take: useful to establish new facts, but can push further on general lessons to increase the impact

- Moving to a **directed search market** reveals that investor characteristics matter a lot for CRE prices and deal flow
- Methodological contributions using **ML tools (LGBM model, negative sampling)**
- **Significant data contributions** in tracking owners across transaction chains, linking CRE leasing to property sales
  - Still, requires some non-trivial imputations $\longrightarrow$ better data vs. better model?
- All of these together make a great paper, but overall lessons for the industry are unclear
  - Current applications are illustrative but perhaps not the most useful
  - **Agenda:** forecasting submarket demand, site selection, how investors would respond to macro shocks (e.g., rapid rate hike cycle, bank failures)

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THANKS!