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Commercial Real Estate as an Asset Class

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Abstract

We survey the properties of commercial real estate (CRE) as an asset class. We first illustrate its importance relative to the US economy and to other asset classes. We then discuss CRE ownership patterns over time. While the academic literature has emphasized Real Estate Investment Trusts, about two-thirds of the value of CRE is owner occupied. We next study the return properties of CRE indices and discuss what is known about the returns to individual properties. We briefly discuss CRE debt before turning to property derivatives. Finally, we consider how including CRE in a portfolio affects the portfolio's performance.

1. THE IMPORTANCE OF COMMERCIAL REAL ESTATE

Commercial real estate (CRE) represents an important asset class in the portfolios of pension funds, life insurance companies, sovereign wealth funds, and other institutional investors. High-net-worth individuals also invest in commercial real estate. Unlike the public markets in which other assets, like common stock, trade, commercial real estate transactions take place in private, illiquid markets.

The nature of real estate markets, in which properties are bought and sold in deals between a private buyer and a private seller, means that it is more difficult to obtain pricing and trading data on CRE. Furthermore, the heterogeneous nature of real estate and the fact that a particular property trades only infrequently and irregularly through time have made it more difficult to adequately document and understand the pricing dynamics of CRE.

The importance of CRE in US financial markets is illustrated in **Figure 1**. We display the amount outstanding of US CRE at market value annually from 1980 to 2017.[1] Alongside, we provide corresponding data for US Treasuries, common stock, and corporate debt. We also present the amount of residential real estate outstanding at market value given its similarities to CRE and the fact that residential real estate represents the largest investment for most individuals. For ease of comparison across these five asset classes, we express the amounts outstanding of a particular asset class as a fraction of that year's GDP and as a fraction of the total value of all five assets. If we view these five asset classes as constituting the investable universe from the perspective of a US investor, **Figure 1*b*** depicts the weights of the resultant value-weighted portfolio.

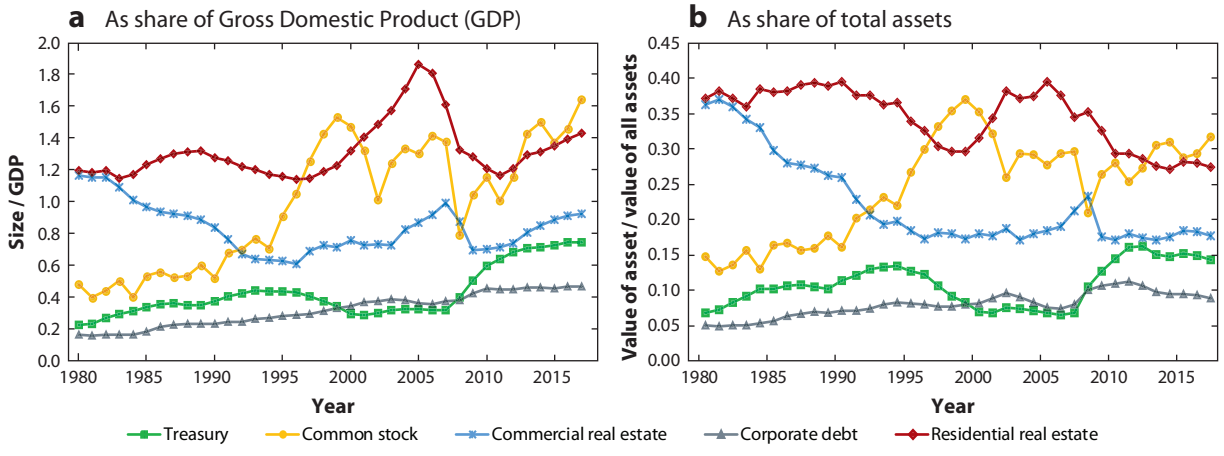

Figure 1

US asset classes, 1980–2017. Panel *a* gives the amount outstanding of an asset class relative to GDP, while panel *b* gives the amount outstanding of an asset class relative to the total value of all asset classes. Commercial real estate is measured as the sum of LM105035005.Q (nonfinancial corporate business real estate at market value) and LM155035005.Q (households and nonprofit organizations real estate at market value), both from Federal Reserve Flow of Funds. US Treasuries are interest-bearing marketable coupon debt including floating rate notes issued by the US Treasury and is obtained from the Securities Industry and Financial Markets Association (SIFMA) website (**https://www.sifma.org/**). Common stock is the market capitalization of all US domestically listed companies and is from the World Federation of Exchanges. Corporate debt includes all nonconvertible debt, medium-term notes, and Yankee bonds and is from the SIFMA website. Residential real estate is measured by LM155035005.Q (household and nonprofit organizations real estate at market value) from Federal Reserve Flow of Funds. US GDP is GDPA from the US Bureau of Economic Analysis.

[1]Throughout this article, we focus on data from the US CRE market.

From **Figure 1*a*** we see that in 1980 CRE and residential real estate represented the largest asset classes in the United States relative to GDP. The amounts outstanding of the other asset classes were much smaller, with the amount outstanding of US common stock exceeding the amounts outstanding of Treasuries and corporate debt. Subsequently, the amounts outstanding of CRE and residential real estate grew, but at a rate slower than the amounts outstanding of common stock, Treasuries, and corporate debt. Today common stock represents the largest asset class in the United States, slightly larger than residential real estate outstanding, while the amount of Treasuries outstanding is almost comparable to that of CRE. In **Figure 1**, we see the stock market bubble and subsequent correction between the late 1990s and early 2000s as well as the run-up in residential real estate valuations in the early to mid-2000s followed by the Great Recession. We also note that the relative value of CRE declined in the first part of our sample, due to the downturn in commercial property prices in the early 1990s, but has remained fairly stable since the mid-1990s. Overall, while non-CRE asset classes have grown, CRE remains an important asset class in the US investment landscape.

The next section decomposes the ownership of CRE by institutional type and shows that the majority of CRE is owned by owner-occupiers. We also discuss differences between public and private real estate in Section 2. We document the properties of CRE equity returns in Section 3. Section 4 discusses CRE debt, while Section 5 provides an overview of CRE derivatives. We integrate our discussion of CRE ownership and returns in a discussion of CRE in a portfolio context in Section 6. We provide concluding remarks in the final section of the review.

2. WHO OWNS COMMERCIAL REAL ESTATE?

Figure 2*a* shows the amount of nonresidential real estate held by various institutions from 1925 to 2016. We exclude real estate directly owned by the government. The stock of nonresidential real estate is valued at slightly over $12 trillion as of the writing of this review. Corporations that use it as an input into production own most of the private nonresidential real estate. This has been

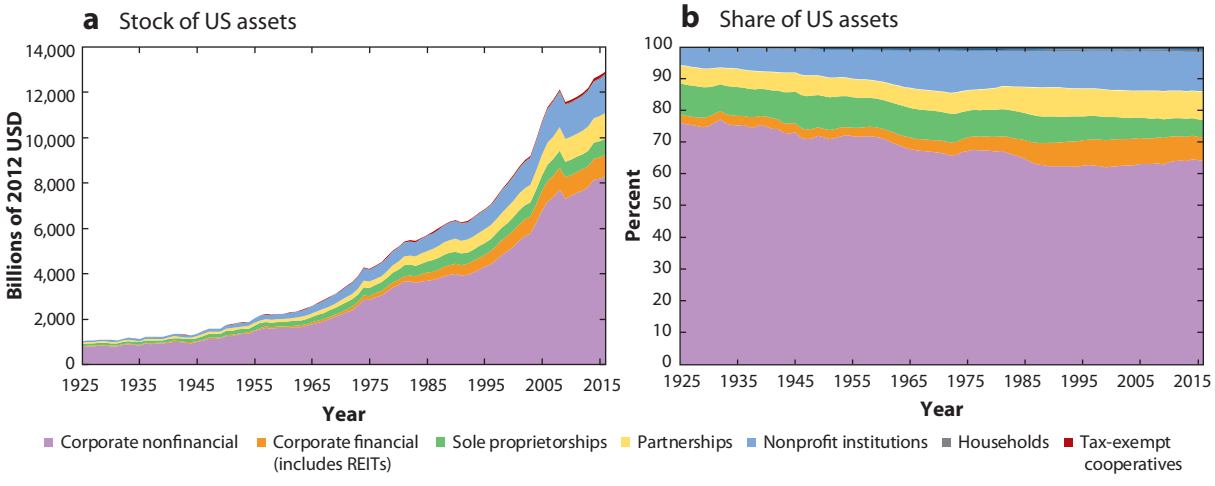

Figure 2

US nonresidential structures, 1925–2016. Panel *a* gives the amount of nonresidential real estate held by an institution while panel *b* gives the share of nonresidential real estate held by an institution. The figure plots current-cost net stock of private nonresidential structures taken from Bureau of Economic Analysis table 4.1. (**https://www.bea.gov/**). The GDP deflator for 1925–1928 is assumed to be equal to the 1929 value since there is no deflator available for 1925–1928. Abbreviation: REIT, Real Estate Investment Trust.

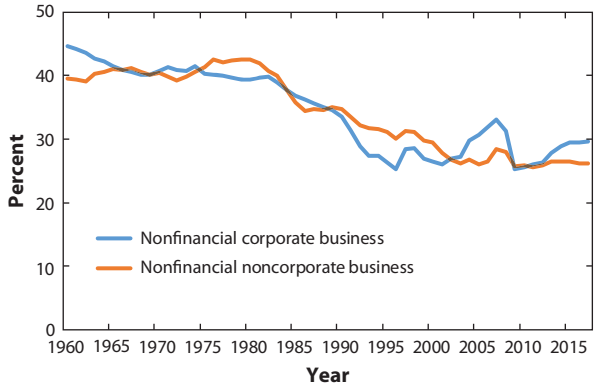

Figure 3

Real estate as a share of firms' assets. The figure plots nonresidential real estate assets as a share of total assets. The share for nonfinancial corporate business may include a small amount of residential real estate. Data come from tables S4 and S5 of the Bureau of Economic Analysis financial accounts of the United States (**https://www.bea.gov/**).

true since at least 1925. **Figure 2*b*** plots the shares of the total stock of nonresidential real estate over time. While the share of CRE held by nonfinancial corporations has trended down slightly since 1925, it still stands at 64%. The decrease in the share held by nonfinancial corporations has largely come from an increase in the share held by financial corporations, particularly after the 1986 Tax Reform Act, which led to an expansion in the share of real estate held by Real Estate Investment Trusts (REITs). Still, as of 2016, corporate financial firms held only 7% of the stock of US CRE, down from a peak of 9% in 2000. There has also been a significant increase in the share held by nonprofit institutions. While in 1925 nonprofit institutions held just 6%, by 2016 they held 13% of the stock of nonresidential real estate.

Not only are corporate nonfinancial holdings of CRE a large share of the total stock, **Figure 3** shows that they are a large share of the assets of nonfinancial firms. As of 2017, nonresidential structures accounted for almost 30% of the assets of both nonfinancial corporate and noncorporate businesses. CRE is a declining share of firms' assets, however. From 1960 to the mid-1980s, CRE accounted for roughly 40% of nonfinancial firms' assets. This decreasing share reflects the fact that firms are more likely to rent rather than own their real estate assets.

Given the size of the corporate real estate market, a large literature has investigated the function real estate performs for corporations. Ambrose (1990) tests whether the market prices corporate real estate assets differently from other corporate assets. Tuzel (2010) shows how the slow depreciation of real estate affects stock returns. Tuzel & Zhang (2017) explore how variation in real estate prices across cities affects firm risk. Gan (2007), Chaney, Sraer & Thesmar (2012), and Wu, Gyourko & Deng (2015) study how firms' ability to use CRE as collateral affects firm investment. Campello & Giambona (2013) and Cvijanović (2014) show how real estate holdings affect firm capital structure. Benmelech, Garmaise & Moskowitz (2005) look at how the redeployability of firms' CRE holdings affects the structure of their loans. Ambrose, Diop & Yoshida (2017) analyze how corporate real estate holdings interact with product market competition and firm risk. Mao (2017) illustrates the relation between corporate real estate holdings and firm innovation.

Because the focus of this review is on CRE as an asset class, we cannot thoroughly review the literature on corporate real estate here, although it is unquestionably important. While firms may use their CRE as collateral, real estate held by corporations is not an asset class in the sense of

Table 1 Real Estate Investment Trust (REIT) and non-REIT commercial real estate (CRE) purchases

Variable	Observations	Mean	Median	SD	Min	Max
A: All transactions						
YearBlt	124,059	1,978.5	1,985.0	26.7	1,111.0	2,020.0
Units	131,082	104	51	169	0	5,500
QScoreNat	110,665	0.56	0.58	0.29	0	1
development	131,739	0.02	0.00	0.15	0	1
office	131,739	0.33	0.00	0.47	0	1
industrial	131,739	0.35	0.00	0.48	0	1
retail	131,739	0.32	0.00	0.47	0	1
B: REIT purchases						
YearBlt	10,586	1,987.8	1,991.0	20.2	1,635.0	2,016.0
Units	11,393	158	98	211	1	4,348
QScoreNat	8,792	0.56	0.57	0.27	0	1
development	11,432	0.03	0.00	0.17	0	1
office	11,432	0.27	0.00	0.44	0	1
industrial	11,432	0.33	0.00	0.47	0	1
retail	11,432	0.39	0.00	0.49	0	1

Variables: YearBlt is the year the property was built or is anticipated to be completed in the case of properties still under development; Units is the number of square feet in thousands; QScoreNat is the proprietary Real Capital Analytics measure of the quality of the property; development takes a value of 1 if the property is under one year of age at the time of purchase; office takes a value of 1 if the property is an office property; industrial and retail are similarly defined. The underlying data, presented by Ghent (2019), come from Real Capital Analytics and cover 39 US Metropolitan Statistical Areas from 2001 to 2015.

being easily investible by an outside investor. Despite owning the majority of the stock of CRE, corporate users are a small share of total transactions in CRE. Ghent (2019) finds that users made less than 3% of CRE purchases over the 2001–2015 period, indicating that corporations purchase real estate and then hold it for a very long period. Often, the reason they choose to own rather than rent relates to the specificity of the asset they require. We also cannot easily measure the returns on real estate held by corporations for their own use. In the remainder of this review, we therefore focus on real estate that firms hold to lease to other firms rather than to use themselves.

The richest data on CRE often come from REITs because they are publicly traded. The empirical REIT literature is voluminous, partly because of the data availability for this segment of the market. It is therefore of interest to know how representative the properties REITs own are of the universe of CRE. **Table 1**, reproduced from the data presented by Ghent (2019), shows how the properties purchased by REITs differ from those purchased by private investors. REITs concentrate their purchases in the retail segment of the market and buy slightly larger and younger properties on average. However, there is no difference in the quality of properties bought by REITs and non-REIT investors.

While there are no obvious observable differences in property purchased by REIT and non-REIT investors other than size and property type, Mühlhofer (2013) points out that REITs select properties primarily based on their net rental income, rather than expected capital appreciation, because they are prohibited by law from holding properties primarily for resale. One of the requirements to be a REIT, for example, is a minimum holding period of four years. We next discuss differences in the returns of publicly and privately held real estate.

Publicly held real estate companies represent a small but growing fraction of the CRE market. To illustrate this fact, in **Figure 4**, we display the market capitalization of all REITs as a percentage of the US CRE market. The value of REITs has increased from less than 1% to slightly over 6%

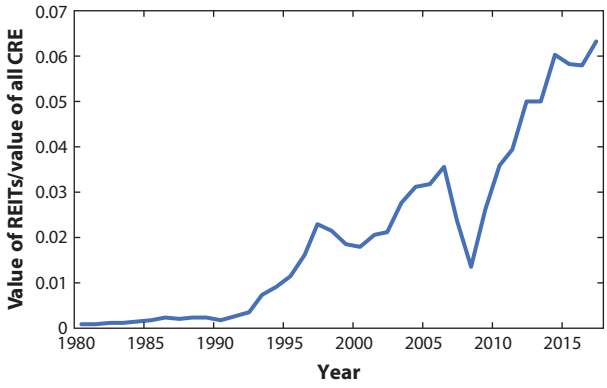

Figure 4

REIT market as a fraction of all CRE, 1980–2017. The figure plots the market capitalization of US REITs as a fraction of the value of total CRE in the United States for the period 1980–2017. The market capitalization of REITs is from Center for Research in Security Prices/Ziman. The value of the US commercial real estate market is as in **Figures 1–3**. Abbreviations: CRE, commercial real estate; REIT, Real Estate Investment Trust.

of all CRE. The growth was slow in the 1980s to early 1990s but accelerated in the second part of the sample period. The 2007–2009 financial crisis had a significant effect on REIT prices. Factors that can explain the dip in the REIT share include the fact that publicly traded companies were particularly hard hit by the crisis, the effect of leverage on equity returns, and the fact that lower valuations of privately held companies were not fully captured during that period.

It might come as a surprise that REITs, despite their recent growth and prominence in academic research, still represent a small fraction of the CRE universe. In other words, CRE is much more than REITs. The overrepresentation of REIT-related papers is undoubtedly related to the availability of high-quality data for public companies, providing researchers with the opportunity to investigate issues in corporate finance (e.g., Hite, Owens & Rogers 1984, Howe & Shilling 1988, Ling & Ryngaert 1997) and asset pricing (e.g., Liu & Mei 1992). Data for privately held CRE companies are much harder to gather. This is true for prices and returns and even more so for information related to ownership, property characteristics (e.g., size, type, condition, depreciation, or occupancy), and financing. Yet the economic magnitude of the non-REIT CRE sector makes it difficult to ignore if we are to fully understand CRE as an asset class. In the next section, we address the empirical challenges of working with non-REIT CRE data.

3. COMMERCIAL REAL ESTATE RETURNS

3.1. Returns on Commercial Real Estate Indices

Table 2*a* displays summary statistics for the returns on CRE indices from five data sources. The first three returns series are the National Council of Real Estate Investment Fiduciaries (NCREIF) Property Index, Real Capital Analytics' (RCA) Commercial Property Price Index (CPPI), and CoStar's Commercial Repeat Sales Index (CCRSI). These series represent the returns of portfolios of privately held CRE and aggregate unlevered property-level returns. The remaining two return series are from the National Association of Real Estate Investment Trusts (NAREIT) and Center for Research in Security Prices (CRSP)/Ziman and are two widely used REIT indices that cover publicly traded CRE. We do not adjust the REIT series for their use of leverage so that they are not directly comparable to the privately held CRE series.

Table 2 Summary statistics on commercial real estate (CRE) index returns

A: Returns on CRE indices					
	NCREIF	CPPI (RCA)	NAREIT	Ziman	CCRSI
	TotRet	TotRet	TotRet	TotRet	PrRet
Mean	9.0	11.9	10.7	11.9	5.5
SD	4.2	5.2	17.4	16.5	5.1
AR(1)	0.782	0.937	0.061	0.095	0.661
Skew	−2.14	−1.60	−0.39	−0.81	−0.98
Frequency	4	4	12	12	12
N	162	64	556	456	267
Sample	1,978.1–2,018.2	2,002.1–2,018.1	1,972.1–2,018.4	1,980.1–2,017.12	1,996.1–2,018.4

B: Income and price appreciation returns on CRE indices								
	NCREIF	CPPI	NAREIT	Ziman	NCREIF	CPPI	NAREIT	Ziman
	IncRet	IncRet	IncRet	IncRet	PrRet	PrRet	PrRet	PrRet
Mean	7.05	7.30	7.74	6.92	1.97	4.54	2.91	5.00
SD	0.65	0.30	1.43	0.96	4.09	5.26	17.26	16.43
AR(1)	0.989	0.951	0.088	−0.047	0.777	0.940	0.067	0.105
Skew	−0.37	0.77	4.98	0.89	−2.03	−1.60	−0.41	−0.81

C: Macroeconomic variables						
	CPI_INF	TB3M	TB10Y	CS	GZ	VW Ret
Mean	3.45	3.49	5.83	3.69	1.81	10.69
SD	1.20	0.91	0.82	1.73	0.28	15.18
AR(1)	0.57	0.99	1.00	0.93	0.97	0.07
Skew	0.62	1.04	0.89	−0.91	2.39	−0.54
Frequency	12	12	12	12	12	12
N	858	1,016	785	377	524	651
Sample	1,947.2–2,018.7	1,934.1–2,018.8	1,953.4–2,018.8	1,987.2–2,018.6	1,973.1–2,016.8	1,964.1–2,018.3

The table displays summary statistics of the five most widely used commercial real estate indices. Panel *a* contains the results for total returns (TotRet), whenever available. Only price appreciation (PrRet) is available for CCRSI. In panel *b*, we show the statistics for the income return (IncRet) and price appreciation (PrRet) parts. The following macroeconomic and finance variables are summarized in panel *c*: consumer price index inflation (CPI_INF), three-month Treasury bill yield (TB3M), 10-year Treasury bond yield (TB10Y), the appreciation of the Case–Shiller repeat residential real estate sales index (CS), the Gilchrist & Zakrajšek (2012) spread (GZ), and the return to the Center for Research in Security Prices value-weighted index (VW Ret). Other abbreviations: CCRSI, CoStar's Commercial Repeat Sales Index; CPPI, Commercial Property Price Index; NAREIT, National Association of Real Estate Investment Trusts; NCREIF, National Council of Real Estate Investment Fiduciaries; RCA, Real Capital Analytics.

We provide statistics for total returns and, when the data are available, both their price appreciation and income components. We report these statistics for the entire sample period for which a particular series is available. In the **Supplemental Tables**, we provide the summary statistics for a much shorter sample period, from 2002 to 2017, that is common across all of the indices. The NCREIF and RCA series are available at a quarterly frequency, while the remaining series are available at a monthly frequency. Means and standard deviations are in annualized percentages.

The average return of privately held CRE is between 9.0% (NCREIF) and 11.9% (RCA). The difference of approximately 3% is not due to the different corresponding sample periods (see **Supplemental Tables**) but rather may reflect a difference in the risk characteristics of

Supplemental Material >

these indices. In particular, the standard deviation of NCREIF returns is lower (4.2%) than that of the RCA returns (5.2%). Some of these differences, however, may reflect the fact that the CPPI is a repeat sales index, while the NCREIF Property Index returns reflect the use of appraisals and exhibit smoothing as a result. By contrast, the average CoStar return is much lower because it does not include an income return component. For publicly held CRE, the average return is between 10.7% (NAREIT) and 11.9% (Ziman). In the common sample period (see **Supplemental Tables**), the two indices have comparable average returns of about 12%. From **Table 2*a*** we also see across all indices that CRE index returns are negatively skewed, with total returns of the NCREIF Property Index being most negatively skewed.

Supplemental Material >

Table 2*b* decomposes CRE total returns into their income and price appreciation components. The income return component is remarkably similar across indices. At about 7%, income returns represent a significant fraction of total CRE returns. Income returns also exhibit low volatility, with relatively little and, in most cases, positive skewness. These results also characterize the publicly traded NAREIT and Ziman indices. Given its relatively large size and low volatility, the income return component of total CRE returns is particularly appealing from a risk-return perspective.

Turning our attention to the price appreciation component of total CRE returns, average price appreciation is between 2.0% (NCREIF) and 4.5% (RCA) for privately held CRE. For publicly held CRE, the average price appreciation ranges between 2.9% (NAREIT) and 5.0% (Ziman). These results indicate that the price appreciation component varies across the indices and that price appreciation in CRE is sensitive to the sample period being considered. Comparing **Table 2*a*** with **Table 2*b***, we see that most of the total variance and negative skewness of the total CRE returns are due to the corresponding price appreciation component. It is the price appreciation component that makes CRE investments risky.

In light of the significant search and other transaction costs present in the privately held CRE market, we see in **Table 2*a*** that the first-order serial correlations of the total returns of privately held CRE indices are high. Total returns of publicly held CRE indices, by contrast, have low first-order serial correlation, in the range of 0.04 to 0.06, reflecting the efficiency of capital markets. The first-order serial correlation patterns of total CRE returns also characterize the first-order serial correlation patterns of their corresponding price appreciation components. The AR(1) coefficient is close to one for the income component of privately held CRE returns but close to zero for the income component of publicly held CRE returns.

Looking across the five CRE returns series, the largest differences are between privately and publicly held indices. We summarize the differences as follows: (*a*) The average total return of CRE is in the range of 9% to 12% per year; (*b*) publicly held CRE returns have higher volatility; (*c*) privately held CRE returns have large downside risk, which makes CRE a riskier investment than suggested by its low variance; (*d*) the income component of private and publicly held indices is about 7% and exhibits little volatility; (*e*) price appreciation accounts for 2% to 4.5% of total returns and is more volatile; and (*f*) the serial correlation of privately held CRE returns is large and positive, capturing the significant frictions prevailing in that market. For publicly held CRE returns, by contrast, the serial correlation is close to zero, as expected given the efficiency of capital markets.

To place CRE into a broader financial and macroeconomic environment, we now focus on one privately held CRE index (NCREIF) and one publicly held CRE index (NAREIT) and consider their relation to a variety of other financial and macroeconomic variables. **Table 2*c*** shows the summary statistics of the following six macroeconomic and finance variables: consumer price index inflation, three-month Treasury bill yield, 10-year Treasury bond yield, the appreciation of the Case–Shiller repeat residential real estate sales index (hereafter CS index), the Gilchrist &

Table 3 Granger causality tests between National Council of Real Estate Investment Fiduciaries (NCREIF) and National Association of Real Estate Investment Trusts (NAREIT) returns

Dependent variable	Constant	NCREIF(-1)	NAREIT(-1)	NCREIF(-2)	NAREIT(-2)	NCREIF(-3)	NAREIT(-3)
NCREIF	0.004	0.586	0.024	0.284	0.013	−0.107	0.013
t-NW	1.92	4.72	2.43	2.64	1.09	−1.14	0.98
NAREIT	0.035	0.994	0.089	−0.507	−0.174	−0.807	−0.017
t-NW	3.40	0.90	1.27	−0.51	−1.77	−1.90	−0.28

Results are based on estimating a vector autoregression with three quarterly lags [VAR(3)]. t-NW denotes *t*-statistics calculated using Newey–West standard errors.

Zakrajšek (2012) credit spread (hereafter GZ spread), and the return to the CRSP value-weighted index. Consumer price index inflation, the three-month Treasury bill yield, and growth in the CS index have comparable averages—3.45%, 3.49%, and 3.69%, respectively. The average GZ spread is 1.81%, the average 10-year Treasury bond yield is 5.83%, and the value-weighted index return is 10.69%. The macroeconomic series are all persistent, with the exception of the inflation rate. The CS index exhibits a significant negative skew, similar to the CRE indices.

The average returns of the NCREIF and NAREIT indices exceed that of the 10-year Treasury bond and are comparable to the average value-weighted stock market return.[2] At first glance, the high mean return and low variance of return to the NCREIF index might seem surprising. However, its large average return might be compensation for the negative skewness and significant downside risk in that portfolio.

The CRE literature has emphasized the efficiency of capital markets in impounding information into REIT returns,[3] leading to their being close to serially uncorrelated. The implication is that NCREIF returns will be slower to respond to economic shocks. The different time series properties of NCREIF and NAREIT returns in **Table 2** support these claims.

A direct way of investigating the efficiency of capital markets is to run Granger causality tests between privately and publicly held CRE returns. To do so, we estimate vector autoregressions (VARs) of NCREIF and NAREIT returns at quarterly horizons. The results are displayed in **Table 3**. There we see that NAREIT returns forecast NCREIF returns one quarter ahead when controlling for lagged NCREIF returns. The reported *t*-statistics use Newey–West standard errors with an automatic lag selection. Conversely, NCREIF returns do not forecast NAREIT returns. Interestingly, when we estimate a VAR with two quarterly lags, NAREIT returns lagged two quarters also significantly forecast NCREIF returns. In other words, the frictions in the privately held CRE market are significant enough to induce up to six months of lag in price adjustment. Lags larger than two quarters are insignificant. These results support the efficiency of capital markets and emphasize the significant frictions that exist in the privately held CRE market. The reported results are all in sample because our short data set does not allow us to conduct an out-of-sample comparison.

We are not the first to investigate the relation between public and private CRE returns; a large literature has examined this issue. For example, Riddiough, Moriarty & Yeatman (2005) compare unlevered REIT returns with NCREIF returns after adjusting for partial-year financial data, differences in property type mix, and fees. They conclude that, after these adjustments, public CRE returns exceed private CRE returns by approximately three percentage points. However,

[2] Anderson et al. (2005) argue that REIT returns behave very much like small-cap value stocks in other industries.

[3] See, for example, Fisher et al. (2003), Riddiough, Moriarty & Yeatman (2005), and Yavas & Yildirim (2011).

Table 4 Forecasting National Council of Real Estate Investment Fiduciaries (NCREIF) and National Association of Real Estate Investment Trusts (NAREIT) returns with other state variables

Dependent variable	NCREIF IncRet(-1)	NAREIT DIVYLD(-1)	CPI_INF (-1)	TB3M(-1)	TB10Y(-1)	VW RET(-1)	GZ(-1)	CS(-1)
NCREIF	0.70	−0.45	0.15	0.03	0.03	0.03	−1.45	0.28
t-NW	1.77	−0.78	1.61	0.31	0.36	1.80	−2.02	1.75
NAREIT	3.34	5.67	1.70	0.29	0.66	0.09	−1.98	0.74
t-NW	1.42	1.72	1.60	0.48	1.03	0.50	−0.43	0.88

Variables: NCREIF IncRet is the income component of the return to the NCREIF index; NAREIT DIVYLD is the dividend yield of the NAREIT index; CPI_INF is the consumer price index inflation; TB3M is the three-month Treasury bill yield; TB10Y is the 10-year Treasury bond yield; VW RET is the return to the Center for Research in Security Prices value-weighted index; GZ is the Gilchrist & Zakrajšek (2012) spread; CS is the appreciation of the Case–Shiller repeat residential real estate sales index. t-NW denotes *t*-statistics calculated using Newey–West standard errors.

Riddiough, Moriarty & Yeatman (2005) do not adjust for appraisal-smoothing in the NCREIF data. Pagliari, Scherer & Monopoli (2005) do adjust for appraisal-smoothing but not for fees, and they find comparable private and public market returns. Ling & Naranjo (2015) use a version of the NCREIF data that mitigates the appraisal-smoothing problem and still find that REITs outperform private CRE but by a much more modest amount than what Riddiough, Moriarty & Yeatman (2005) find. Consistent with our findings in **Table 3**, Gyourko & Keim (1992), Yavas & Yildirim (2011), and Ling & Naranjo (2015) find that REIT returns lead private market CRE returns. Boudry et al. (2012) find that the relation between REIT and private CRE returns is tighter at longer horizons.

The CRE literature conjectures that expected returns vary over time due to changes in the state of the economy (see, for example, Plazzi, Torous & Valkanov 2010). While expected returns are not directly observable, one might indirectly capture their time variation using state variables that proxy for changes in the investment opportunity set. Following this line of reasoning, researchers have investigated whether various economic variables are able to capture future fluctuations in, or forecast, CRE returns (see, for example, Ghysels et al. 2013 and references therein).

We revisit these results in **Table 4**. In particular, we ask whether the following state variables forecast next-quarter NCREIF or NAREIT returns: NCREIF log income return, NAREIT log dividend yield, log consumer price index, log three-month Treasury yield, log 10-year Treasury yield, log value-weighted stock return, log GZ spread, and log CS index. Inflation, interest rates, and the stock market return are clearly relevant variables when gauging the state of the economy. For NAREIT returns, the log dividend yield provides a good proxy for time variation in expected returns (Campbell & Shiller 1988 and many REIT predictability papers). In the case of the NCREIF index, we use the log income return as a predictor.[4] All regressions include one lag of the forecast return in addition to the single predictor. We report only the coefficient on the predictor and its Newey–West *t*-statistic.

We see that several state variables forecast NCREIF total returns. Consistent with the results of Plazzi, Torous & Valkanov (2010), the NCREIF total return is forecast by its income return, and the relation is statistically significant.[5] The US stock market return, the GZ spread, and the

[4]We run all forecasting regressions at quarterly frequency, as we want to be able to compare the NCREIF and NAREIT results. For NAREIT returns, the predictability regressions can also be run at monthly horizons, as is done in most of the NAREIT literature. We were interested in the robustness of the predictability returns at quarterly horizons.

[5]The positive relation is not mechanical, as the total return can be decomposed into income and price return, both of which can have their own time series dynamics. In the **Supplemental Tables**, we in fact show that the price return is negatively correlated with future NCREIF returns.

Supplemental Material >

Table 5 Do National Council of Real Estate Investment Fiduciaries (NCREIF) and National Association of Real Estate Investment Trusts (NAREIT) returns lead other macro variables?

Dependent variable	NCREIF(-1)	NAREIT(-1)
INF	0.041	−0.005
t-NW	1.401	−0.622
TB10Y	0.006	0.001
t-NW	1.194	0.746
TB3M	0.018	0.003
t-NW	2.257	1.387
VW Ret	−0.102	−0.056
t-NW	−0.459	−0.639
GZ	0.013	−0.001
t-NW	1.965	−0.745
CS	−0.055	0.004
t-NW	−1.513	0.311

Variables: TB10Y is the 10-year Treasury bond yield; TB3M is the three-month Treasury bill yield; VW Ret is the return to the Center for Research in Security Prices value-weighted index; GZ is the Gilchrist & Zakrajšek (2012) spread; CS is the appreciation of the Case–Shiller repeat residential real estate sales index. t-NW denotes *t*-statistics calculated using Newey–West standard errors.

CS index are all statistically significant forecasters of NCREIF returns at the 5% significance level or better.

By comparison, the time variation of NAREIT returns is not nearly as forecastable. The best forecaster is NAREIT's dividend yield, consistent with the arguments by Campbell & Shiller (1988). None of the other conditioning variables capture future variation in NAREIT returns. The results in **Table 4** imply that NCREIF expected returns and prices are more exposed to cyclical variation in business cycle variables than are the NAREIT expected returns.

Do CRE prices forecast changes in the aggregate economy? To answer this question, we run Granger causality tests that are reverse to those in **Table 4** and investigate whether NCREIF and NAREIT returns forecast macroeconomic and other state variables. These regressions include one lag of the forecast variable, as most of these variables are serially correlated (see **Table 2**). While the residential real estate literature finds that fluctuations in real estate quantities, such as housing starts, rather than prices contain information about the future state of the macroeconomy,[6] we now investigate whether the same holds true for CRE. If we once again take the perspective that equity markets are efficient, we conjecture that NAREIT returns should contain more information about the future state of the economy than NCREIF returns.

The results of the reverse Granger causality tests are provided in **Table 5**. NAREIT returns do not forecast the macroeconomic and stock market variables. We find, however, that NCREIF returns forecast the three-month Treasury bill yield and the GZ spread. These findings are surprising, as the three-month Treasury bill yield and the GZ spread are the two variables that best forecast the state of the economy (Campbell & Ammer 1993, Gilchrist & Zakrajšek 2012). By definition, they should not be forecast by any other variable. This finding suggests that NCREIF returns contain information about the state of the economy that is reflected in lags of the leading macroeconomic forecasters. Why this might be the case is an interesting question for further investigation.

[6]See, for example, Leamer (2007), Ghent & Owyang (2010), and Strauss (2013).

Table 6 Monthly Real Estate Investment Trust index returns by property type, 1994–2018

		Average	SD	Beta	Alpha
Core	Apartments	12.6	19.4	0.64	0.39
	Freestanding retail	13.2	17.8	0.47	0.53*
	Industrial	14.1	29.4	1.00	0.34
	Office	12.3	20.9	1.00	0.34
	Regional malls	13.8	25.2	0.81	0.41
	Shopping centers	10.3	21.5	0.70	0.17
Noncore	Health care	12.5	20.4	0.54	0.43
	Lodging–resorts	9.4	29.7	1.21	−0.15
	Manufactured homes	12.9	17.9	0.50	0.48*
	Self-storage	16.4	19.5	0.51	0.77***
	S&P 500	10.0	14.9	–	–
	10-year US Treasury	4.2	0.5	–	–

Returns are annualized. For alpha, * and *** denote statistical significance at the 10% and 1% levels for a two-sided test. Core and noncore property type designations are from Pagliari, Scherer & Monopoli (2005), whose designations in turn are based on National Council of Real Estate Investment Fiduciaries classifications.

3.2. Returns by Property Type

The CRE industry has traditionally classified properties into core and noncore types. For example, NCREIF defines apartments, freestanding retail, industrial, office, regional malls, and shopping centers as core property types, while health care, lodging–resorts, manufactured homes, and self-storage are defined as noncore property types (see, for example, Pagliari, Scherer & Monopoli 2005). Investors often perceive core property types as well as properties located in the central business district of major markets to be less risky.

Table 6 examines the return properties of REITs focused on different property types. All the returns of core property types have higher means and standard deviations than the S&P 500. The average returns of core property types are all in the range of 10% to 15% annually, with standard deviations ranging from 18% to 29%. Of the core property types, only freestanding retail has a statistically significant alpha, but it is only significant at the 10% level. Industrial and office have betas of 1. Apartments have a beta of 0.6, while retail property types have betas ranging from 0.5 to 0.8.

Overall, the returns on REITs focusing on noncore properties do not indicate that noncore properties are any riskier than core properties. Furthermore, the returns of noncore properties may be less cyclical than those of core properties. Of the noncore property types, health care, manufactured homes, and self-storage all have betas of around 0.5, while lodging has a beta of 1.2, consistent with vacation expenditures being highly cyclical. Lodging REITs have also returned an average of only 9% per year, with a standard deviation of 30%. In contrast, self-storage has the highest average returns, at 16.4% per year, with a standard deviation slightly below that of most core property types. Furthermore, self-storage has a statistically significant alpha. However, the alpha is only 77 basis points per year. Finally, REITs of property types with high average returns tend to have low betas. This betting-against-beta anomalous behavior, which has been pointed out for non-REIT equities by Frazzini & Pedersen (2014), is particularly pronounced for noncore REITs. In particular, lodging–resorts has a large beta, of 1.21, and a low average return, of 9.4%, whereas health care, manufactured homes, and self-storage have betas of around 0.5, but their returns are 12.5% or higher.[7]

[7]See Van Nieuwerburgh (2019) for additional analysis of returns by property type.

3.3. Property-Level Returns

Much less is known about property-level returns than about index returns. Measuring property-level returns is difficult both because property net operating incomes are rarely reported and because of the scarcity of transactions. Ghent (2019) finds that only about 5% of the US CRE stock transacts in any given year. In contrast, turnover in the corporate bond market is about 50% annually according to Duffie, Gârleanu & Pedersen (2007). Because properties are heterogeneous and transact infrequently, analysts frequently use appraisal values to construct property-level returns. Unfortunately, for the same reason that returns themselves are difficult to measure in private CRE, appraisal values are often quite far from the actual price at which commercial property transacts. For example, Cannon & Cole (2011) find that appraisal values are, on average, 12% different from actual sales prices.

Sagi (2017) highlights the difficulties of measuring CRE returns on individual properties given the selection of which properties transact in a search model. What is often referred to as transaction risk constitutes one of the largest, if not the largest source of risk in CRE investing. A further reason to analyze property-level returns is that, as Plazzi, Torous & Valkanov (2011) show, exploiting property characteristics can improve performance of commercial property portfolios.

4. COMMERCIAL REAL ESTATE DEBT

We turn now to how firms finance the purchase of CRE. **Figure 5** shows that the stock of commercial mortgages has never amounted to more than 25% of the stock of CRE. In part, this is because of the high share of corporate real estate discussed in Section 2. While corporations do borrow against their CRE assets (see, for example, Campello & Giambona 2013), they often do so using unsecured debt rather than mortgages. Indeed, of all CRE mortgages originated by banks, only 33% of them are on owner-occupied property (Black, Krainer & Nichols 2017). Given that owner-occupiers account for almost two-thirds of CRE, most corporate real estate is financed with unsecured debt rather than mortgages.

Thus, a more relevant question for a CRE investor who is not a corporate user is how real estate firms finance their CRE. Fortunately, there is a rich literature on the leverage of real estate firms.

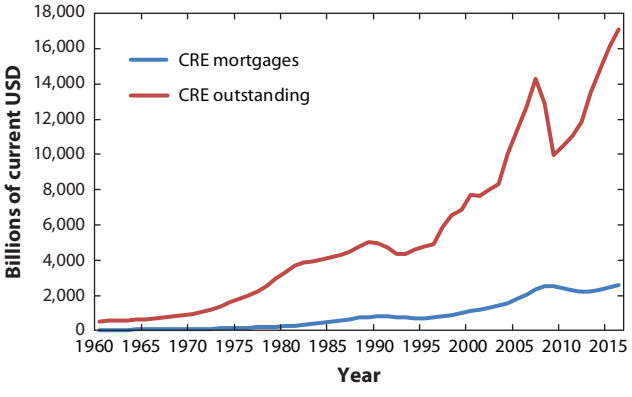

Figure 5

The figure plots the stock of mortgages on US commercial real estate (CRE) versus CRE in billions of current US dollars for the period 1960–2017. Dollars are nominal dollars. CRE mortgages is from Federal Reserve Economic Data series MDOTPNNRP, originally reported in millions of US dollars. CRE is the sum of US Financial Accounts series LM115035035.A and LM105035005.A, originally reported in millions of US dollars.

The literature finds that US equity REITs operate at approximately 35–50% leverage.[8] Unlike US REITs, international REITs often have legal maximums on their leverage (see table 2 of Packer, Riddiough & Shek 2014). Riddiough & Steiner (2017) report that about 63% of US REIT debt is mortgage debt, with the remainder being unsecured.

Private CRE operates at slightly lower leverage than REITs on average. In a sample of global private equity funds, Alcock et al. (2013) report an average leverage ratio of about 30%. Curiously, riskier funds that market themselves as opportunity or value-add have higher leverage than core funds.[9]

4.1. Mortgage Debt Sources

While banks and conduits are major sources of both CRE and residential real estate debt, life insurance companies are also a major source of CRE debt. Specialized CRE finance companies are also a significant source of CRE mortgage lending. Ghent & Valkanov (2016) report that, over the 2005–2012 period, depository institutions accounted for just over 50% of originations, with the balance coming from loans in commercial mortgage-backed securities (CMBS), life insurers, and other nonbank lenders.

CRE debt is much less likely to be securitized than residential debt. At the peak of securitization, CMBS loans accounted for less than 30% of CRE mortgages and constituted a negligible share of commercial mortgages until the mid-1990s (see figure 1 of Black, Krainer & Nichols 2017). Development loans are almost never financed with securitized loans, likely because of the high degree of monitoring they require (Ghent & Valkanov 2016). In general, securitized loans allow the borrower to go to a higher loan-to-value ratio than loans lenders hold on their balance sheet (Black, Krainer & Nichols 2017). Furthermore, borrowers are more likely to have to seek CMBS financing for a large loan since lenders do not want to expose themselves to the idiosyncratic risk of a very large loan (Ghent & Valkanov 2016). Finally, CMBS loans almost always require the borrower to defease the loan if the borrower wants to prepay (Dierker, Quan & Torous 2005). While CRE loans usually provide the lender with some sort of prepayment protection, full defeasance may be especially onerous for the borrower.

Anecdotally, borrowers report that the main reason they opt for a loan from a securitized lender rather than a balance sheet lender is the higher leverage permitted on CMBS loans. Furthermore, CMBS loans are also universally nonrecourse, while some balance sheet loans permit the lender recourse under certain circumstances (e.g., when the borrower triggers a bad boy clause). Borrowers weigh these benefits against the inflexibility of CMBS loans. In addition to more flexible prepayment penalties, a CMBS loan may not allow the borrower to change any of the leases or tenants or might require the trustee to approve any significant change.

4.2. Commercial Real Estate Debt Maturities and Amortization

Unlike residential loans, most CRE mortgages are not fully amortizing. They also have much shorter terms. Typically, borrowers will finance a fully stabilized property (i.e., one not under development or major renovations and with an occupancy rate above 90%) with a so-called

[8] See, for example Sun, Titman & Twite (2015), Pavlov, Steiner & Wachter (2018), and Riddiough & Steiner (2017).

[9] While the terms are not precisely defined, opportunity and value-add funds invest in riskier properties in addition to using more leverage. Core funds usually invest only in properties with high occupancy rates and often further restrict themselves to properties in the central business district, properties in major metro areas, and/or large properties. Pagliari (2016) argues that opportunity and value-add funds underperform core funds after leverage has been adjusted for.

permanent loan that has a maturity of seven to ten years. See Black, Krainer & Nichols (2017) for the distribution of maturities of CRE loans on bank and CMBS loans.

5. COMMERCIAL PROPERTY DERIVATIVES

Derivatives play an important role in today's financial markets. For example, derivatives have proved to be an effective tool in managing the risks associated with an underlying asset. Derivatives also improve the efficiency of the market for the underlying asset by allowing investors to take positions in the asset at a lower cost and subject to lower transaction costs. In the case of CRE, property derivatives would allow investors to synthetically gain or minimize exposure to a particular property market without incurring the substantial search and closing costs associated with a CRE transaction. Unfortunately, while option contracts, both calls and puts, are available for most REITs, the market for derivatives written on privately held property is nearly nonexistent.

The recent history of property derivatives in the United States is rather brief. The first property derivatives trade in the United States did not occur until April 2005, through Credit Suisse's exclusive two-year agreement with NCREIF to use the NCREIF Property Index. There were two to three trades in 2005 and a few more trades in 2006, but Credit Suisse's license expired later in 2006. Subsequently, in October 2007, Chicago Mercantile Exchange launched trading in futures and options on the S&P/Global Real Analytics Commercial Real Estate Indices (SPCREX). The production of SPCREX ceased by December 2008.

Property derivatives have enjoyed more acceptance in the United Kingdom. There, regulatory changes in 2002 jump-started a nascent property derivatives market. In particular, the former Financial Services Authority allowed life insurance companies, which own the majority of CRE in the United Kingdom, to include real estate swaps and forwards as admissible assets in the computing of their solvency ratios. In 2004, Inland Revenue standardized the taxation of property derivatives and allowed losses through the use of derivatives to be offset against capital gains. By 2004, 21 investment banks had acquired licenses to use Investment Property Databank indices to offer property derivatives, primarily total return swaps, in the United Kingdom. The Investment Property Databank swaps market grew rapidly in the United Kingdom thereafter, peaking at 265 contracts (£3.5 billion notional) written in the first quarter of 2008. The market then, like in the United States, became a victim of the financial crisis.

There are a number of reasons why the UK property derivatives market was more successful than its US counterpart. These reasons may offer clues as to what is needed to launch a successful property derivatives market in the United States. First, the UK CRE market is less geographically fragmented, which contributes to more effective hedging and less basis risk. It is also the case that, unlike in the United States, there is widespread acceptance of a single index (Investment Property Databank) that covers a majority of the UK property market. The demand of UK property funds for property derivatives was a key driver of the market's development, as these funds played a significant role in driving the necessary regulatory and accounting changes. By contrast, portfolio managers and pension funds in the United States did not actively seek out derivative products, suggesting that more effort in educating end users in the United States of the benefits of property derivatives is needed. Finally, property transaction costs are higher in the United Kingdom, making property derivatives more attractive.

6. COMMERCIAL REAL ESTATE IN THE PORTFOLIO

What do returns on a portfolio with and without CRE look like? Hedging and overall risk reduction are often stated as being important reasons for investing in CRE. We perform the following exercise to answer this question. We assume that a representative investor allocates wealth across

Table 7 Commercial real estate (CRE) in the portfolio: portfolio returns with and without CRE

	Market return (1)	Portfolio without CRE (2)
1980–2017		
Mean	11.8	11.2
SD	11.0	10.6
Ratio	1.08	1.05
1980–1996		
Mean	14.7	14.4
SD	10.5	10.8
Ratio	1.39	1.34
1997–2017		
Mean	9.7	8.8
SD	10.8	9.9
Ratio	0.90	0.89

Column 1 shows the average annual returns to a portfolio assuming the investor invests in US Treasuries, US corporate bonds, US equities, and US CRE in the same proportions as they appear in **Figure 1** reweighted to exclude residential real estate. Column 2 shows the average annual returns to a portfolio that invests only in US Treasuries, US corporate bonds, and US equities in same weights as they appear in **Figure 1** reweighted to exclude both commercial and residential real estate.

Treasuries, corporate bonds, stocks, and CRE. We do not include residential real estate in our market portfolio; historically, residential real estate has not been readily investible for the average portfolio manager. We take the 10-year US Treasury rate as the Treasury return, the ICE BAML US Corporate Master Total Return Index as our corporate bond return, the Wilshire 5000 Total Market Full Cap Index as the stock index, and the NAREIT All Equity REIT Return series as our CRE return index. We then construct a portfolio by following the very simple asset allocation rule of setting portfolio weights according to the same shares as the assets appear in the market portfolio shown in **Figure 1**.

Table 7 shows the average annual returns and standard deviations of the portfolio with CRE, i.e., the market portfolio, and a portfolio without CRE. Over both the 1980–1996 and 1997–2017 subperiods, the market portfolio had a slightly higher average return and a slightly higher mean return/standard deviation ratio. This comes despite the unusually large declines in CRE prices in the wake of the Savings and Loan crisis. Firstenberg, Ross & Zisler (1988) make a somewhat similar point about the optimal weight of CRE in an investor's portfolio but using data from 1969 to 1985.

Our portfolio calculation assumes that managers invest approximately 25–30% of their portfolios in CRE. This is much higher than the allocations to CRE of most institutional investors. One challenge to attaining allocations of 25–30% CRE portfolio weights is that, as discussed in Section 2, approximately 65% of the value of CRE is owner occupied. However, if we considered owner-occupied CRE as not part of the stock of CRE in the market portfolio, then investible CRE is only $0.25 \times (1 - 0.65) = 9\%$. A 9% allocation to CRE is similar to what Andonov & Rauh (2018) report as average pension fund allocations to CRE. Thus, a significant increase in allocations of institutions to CRE likely requires that a significant fraction of firms that currently own their real estate become renters.

7. CONCLUSIONS

CRE is a large and important asset class in the US investment landscape. Compared to common stock, corporate debt, or Treasury instruments, however, commercial properties are heterogeneous

in their characteristics and trade infrequently over time. When trades do occur, they are usually between a private buyer and private seller. As a result, it is more difficult to document various features of the CRE market, especially the pricing dynamics of commercial properties.

Notwithstanding these inherent data limitations, we have put forward a comprehensive survey of CRE as an asset class. What is particularly noteworthy about CRE is that there exist both public and private CRE markets. We compare publicly held REITs to privately held CRE and establish the important diversification benefits that result from adding CRE to portfolios invested in other assets.

This survey has concentrated on the US CRE market. However, CRE is an important asset class globally. Commercial property markets exist throughout the world. Investment in these markets provides investors with additional opportunities to avail themselves of the diversification benefits of CRE.

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

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