Asset Productivity, Local Information Diffusion, and Commercial Real Estate Returns

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Motivation

Perceived Productivity of A Firm's Assets

Unlike stocks, much less is known about asset-level performance...

- Asset-level cash flows are rarely disclosed
  - Examples: a plant, R&D
- No active market
  - Market value is not observable
- For real estate assets, there is an **active "parallel" private market**...
  - whereas its valuation typically diverges from stock market cap

Motivation

Research Questions

Research Question 1 How to measure the **perceived productivity** of a firm's underlying assets?
Research Question 2 Does the perceived productivity of a firm's underlying assets predict *cross-sectional* stock returns?

- How fast does the return predictability dissipate?
- What drive the predictability?

Major Takeaways

- We gauge the perceived productivity of of a firm's underlying assets using **property portfolio returns** (*PPR*).
- *PPR* is a proxy for the average productivity of properties in the same location and of the same type
- Our *PPR*-based measures help predict the cross-section of stock returns.
  - Return predictability lasts for one year
  - *PPR* also predicts "unlevered" returns & Q
  - No evidence of reverse predictability
  - Not driven by (local) liquidity
- Predictability is driven by price appreciation
- More pronounced in gateway markets

Contribution

Stock returns are driven by the perceived productivity of a firm's underlying assets

- **"Geographic Footprint"**
  - Headquarters linkages Dougal et al. (2015), Jannati et al. (2019)
  - 10-K based citation share Bernile et al. (2015), Addoum et al. (2017)
  - Value-based property share Ling et al. (2019)
- **"Asset Productivity"**
  - HQ state-level economic activity index Korniotis and Kumar, (2013), Smajlbegovic, (2019)
  - The economic meaning is difficult to interpret
    - What does 1% increase in a state's economic activity index tell us?

Contribution

Private and Public CRE Returns

- Public predicts private at the index level Nelling and Gyourko, 1998; Ling, Naranjo, and Ryngaert, 2000
- The relation between private and public CRE returns Riddiough, Moriarty and Yeatman 2005; Pagliari, Scherer and Monopoli, 2005; Horrigan, Case, Geltner, and Pollakowski, 2009; Boudry, Coulson, Kallberg and Liu, 2013; Yunus, Hansz and Kennedy 2012; Muhlhofer, 2013; Ling and Naranjo, 2015
- We find **private predicts public at the firm level**

Measuring the Productivity of A Firm's Assets

- We focus on equity REITs, which mainly invest in income-producing properties
- We can measure their **"geographic footprint"**
- In addition, there is an **active "parallel" private market** for these properties
- Property transactions are recorded and compiled by several firms and industry associations
  - National Council of Real Estate Investment Fiduciaries (**NCREIF**)
  - Quarterly estimates of **property-level returns** of a wide variety of property types in over 300 metropolitan areas
  - A proxy for the average productivity of properties in the same location and of the same type

Measuring the Productivity of A Firm's Assets

Property-Level Return (*PPR*), the *weighted average* of NCREIF sub-indices

- The weight, or **property share**, is the % a firm's book value of assets invested in each property type in each MSA
- Match property shares to returns on the corresponding NCREIF property-MSA sub-indices
  - For example, the return on office properties in New York
- If missing MSA-level index? Use state-level index ...
- Control for **systematic risk factors**.
  - *Capital market*: market factor, funding liquidity, size, value & momentum
  - *Property market*: NCREIF national index, transaction volume
- Control for economic activity indices (state- and MSA-level)

Measuring the Productivity of A Firm's Assets

Property-Level Return (*PPR*), the *weighted average* of NCREIF sub-indices

- Appraisal smoothing (Geltner, 1992; Ling & Geltner, 2007)
  1. Using past comparable sales induces a backward-looking bias
  2. Formal appraisal is conducted annually and asset managers are responsible for updating the quarterly numbers internally
- We want to capture the variation in the speed of information diffusion **across property types and locations**
  - **not through time...**
- We rely on NCREIF indexes as a source of information that is widely adopted by asset managers
- We also use annualized *PPR* to mitigate the smoothing issue

Sample Construction

- Start with a sample of 415 equity REITs obtained from **CRSP Ziman** REIT database from 1996-2018.
- Merge firm-level data with quarterly (annual) financial data from **Compustat**
- Merge with **S&P Global** property holdings data
  - The data begins in 1995, which dictates start of our analysis
- Match with **NCREIF** indexes
- Final sample: 6,591 firm-quarters (1,754 firm-years)

PPR & Stock Returns

- *1. Does property portfolio returns (PPR) predict the cross-section of REIT returns?*
- Estimate the following Fama-MacBeth regression model:

$$RetRf_{i,t+1} = \alpha + \beta_1 PPR_{i,t} + \beta_2 IEA_{i,t} + \gamma X_{i,t} + \phi_i + \epsilon_{i,t} \quad (1)$$

- where,
  - $RetRf_{i,t+1}$ is REIT i's return in excess of 30-day T-bill rate in quarter (year) $t+1$
  - $PPR_{i,t}$ is a proxy for the average productivity of properties in the same location and of the same type
  - $X_{i,t}$ is a vector of return predictors...
    - including size, B/M, momentum
  - ϕ_i controls for property type fixed effects

PPR & Stock Returns

RetRf	(1) QTR	(2) QTR	(3) QTR
PPR (Lag 1)	**0.660***** **(3.94)**		
α*PPR (Lag 1)*		**0.550***** **(3.20)**	
Oα*PPR (Lag 1)*			**1.198***** **(3.20)**
IEA	0.440 (0.94)	0.403 (0.83)	0.365 (0.73)
Controls	Yes	Yes	Yes
PropFE	Yes	Yes	Yes
R-squared	0.382	0.381	0.381
# Obs	6,591	6,591	6,591

PPR & Stock Returns

- *1. Do property portfolio returns predict the cross-section of REIT returns?*
- **Yes**, the estimated coefficients on all three *PPR*-based measures are positive and significant
- More importantly, the **economic magnitude is large**
  - An change in αPPR from the bottom to the top quartile is associated with an increase in *RetRf* of 0.85 pt (mean=2.53%)
- The effect of local economic activity (measured by *IEA*) on returns is muted (less labor-intensive)
- Momentum and profitability predict returns.
- These findings also hold for annual data & panel regression.

Return Predictability of *PPR*

- *2. How fast does the return predictability of PPR dissipate?*
- Estimate the following Fama-MacBeth regression model:

$$RetRf_{i,t+1} = \alpha + \beta_1 PPR_{i,t-n} + \beta_2 IEA_{i,t} + \gamma X_{i,t} + \phi_i + \epsilon_{i,t} \quad (2)$$

- where,
  - $RetRf_{i,t+1}$ is REIT i's return in excess of 30-day T-bill rate in quarter $t+1$
  - $PPR_{i,t-n}$ is the lagged αPPR in quarter t-n
    - where $n = 0$ to 4

Return Predictability of *PPR*

RetRf	(1) *Lag 1*	(2) *Lag 2*	(3) *Lag 3*	(4) *Lag 4*	(5) *Lag 5*
α*PPR (Lag)*	**0.582***** **(3.46)**	**0.656**** **(3.37)**	**0.537**** **(2.61)**	**0.466**** **(2.63)**	**0.354*** **(1.73)**
IEA	0.403	0.606	0.185	0.653	0.503
Control	Yes	Yes	Yes	Yes	Yes
PropFE	Yes	Yes	Yes	Yes	Yes
R-squared	0.386	0.388	0.393	0.388	0.393
# Obs	6,255	6,255	6,255	6,255	6,255

Decompose *PPR*

- *3. Which PPR component(s) predicts stock returns?*
- Estimate the following Fama-MacBeth regression model:

$$RetRf_{i,t+1} = \alpha + \beta_1 \alpha PPR\ PRC_{i,t} + \beta_2 \alpha PPR\ INC_{i,t} + \beta_3 IEA_{i,t} + \gamma X_{i,t} + \phi_i + \epsilon_{i,t} \quad (3)$$

- where,
  - $RetRf_{i,t+1}$ is REIT i's return in excess of risk-free rate
  - $\alpha PPR\ PRC_{i,t}$ ($\alpha PPR\ INC_{i,t}$) is the **price appreciation (income return) component** of αPPR
- *The std. dev. of $\alpha PPR\ PRC_{i,t}$ ($\alpha PPR\ INC_{i,t}$) is almost 4 times of its mean!*

Decompose *PPR*

RetRf	(1) QTR	(2) QTR	(3) QTR
α*PPR PRC (Lag 1)*	**0.487***** **(2.68)**		**0.520***** **(2.74)**
α*PPR INC (Lag 1)*		-0.719 (-0.73)	-1.408 (1.19)
IEA	0.308 (0.62)	0.655 (1.34)	0.447 (0.88)
Controls	Yes	Yes	Yes
PropFE	Yes	Yes	Yes
R-squared	0.378	0.385	0.395
# Obs	6,591	6,591	6,591

Decompose *PPR* - Same-Store NOI Growth

- *Do property portfolio returns predict the growth rate of net operating income (NOI)?*

$$\begin{aligned} \textit{Total return} &= \textit{income return} + \textit{price appreciation} \\ &= \frac{NOI_1}{MV_0} + \textit{NOI Growth} \end{aligned} \tag{4}$$

- But in reality, NOI growth might be contaminated by new acquisitions...
- **Solution: "same-store"** NOI growth (*SS NOI Growth*)
  Ambrose et al. (2000)
  - the % change in NOI on properties owned for **the entire current period and the entire previous period**
  - available for a restricted sample
- *Replace the dependent variable with SS NOI Growth.*

Same-Store NOI Growth

RetRf	(1) QTR	(2) QTR	(3) ANN	(4) ANN
αPPR (Lag 1)	**0.672*** (5.34)**		**0.724*** (2.91)**	
αPPR PRC (Lag 1)		**0.647*** (4.04)**		**0.876*** (2.28)**
αPPR INC (Lag 1)		-0.085 (-0.08)		-2.436 (-1.52)
IEA	0.779** (2.50)	1.042*** (3.63)	0.349 (0.65)	0.017 (0.02)
Controls	Yes	Yes	Yes	Yes
FirmFE	Yes	Yes	Yes	Yes
TimeFE	Yes	Yes	Yes	Yes
R-squared	0.432	0.469	0.435	0.478
# Obs	3,869	3,869	3,869	3,869

Additional Tests & Robustness

- Portfolio sorts
- *PPR* innovation also predicts stock returns
- *PPR* predicts "unlevered" returns Ling and Naranjo (2015)
- *PPR* predicts firm value ("Green Street" Q)
- No evidence that predictability runs from private to public Riddiough et al (2005), Pagliari et al (2005), Boudry et al (2013)
- No evidence that (local) liquidity drives our results Downs and Zhu(2019)
- Gateway markets better explain the results
- *PPR* "innovation" also predicts stock returns
- Exploring information friction
  - limited attention
  - geography of investors

Conclusion

- We propose a new measure of asset-level productivity (*PPR*)
- Our *PPR*-based measures positively and significantly predict future *cross-sectional* stock returns
  - **local information diffusion**
  - from property market to stock market **at the firm level**
- *PPR*'s return predictability is driven by price appreciation rather than income return

THANK YOU!

- Questions and Comments?
- Paper available @ssrn https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3628872