# Private Real Estate Returns, Style Drift, and Procyclical Risk Taking*

Spencer J. Couts†

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**Abstract**

This paper documents that development exposure is an important determinant of private real estate returns and market risk exposure. It also documents that open-end private real estate funds have time-varying, procyclical market risk exposure through their development activities. As such, these funds are disproportionately exposed to the downside of the market cycle. Lastly, I find that fund flow pressure is the primary driver of time-varying development exposure. Funds buy a higher proportion of safe, liquid assets compared to risky, illiquid assets when they have larger unfulfilled subscriptions. While this increases assets under management quicker, it also hurts existing investors by decreasing their market risk exposure at the time when it is the most desirable and beneficial. Additionally, funds stop developing as redemption requests increase, leading to lower market risk exposure when the market recovers.

JEL Classification: G11, G12, G13, G14, G23, R33
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†University of Southern California, Lusk Center of Real Estate, 319 Ralph & Gold Lewis Hall, 650 Childs Way, Los Angeles, CA 90089. Phone: (972) 836-8604. Fax: (213) 740-6170. E-mail: couts@usc.edu.

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# 1 Introduction

How and why do private real estate funds adjust their market risk exposure over time? Funds may vary their exposures, or keep it constant, for various reasons. Funds might keep relatively stable risk exposures over time in order to invest in a way that is consistent with their stated investment styles. Alternatively, funds might adjust their market risk exposure if they believe they can "time" the market (Bollen and Busse (2001), Jiang et al. (2007), Chen and Liang (2007)). Another reason funds may increase their risk exposures is to obtain higher expected returns when their target returns become harder to achieve (reaching for yield, Becker and Ivashina (2015)). Lastly, funds might be incentivized to change their market risk exposure when they feel pressure to place or redeem capital quickly while more liquid assets have less risk exposure. [1] No paper has evaluated if there is a systematic pattern to how private real estate funds evolve their market risk exposure over the market cycle nor the reasons why these patterns may exist. Additionally, no other paper has evaluated whether development exposure (the percent of the portfolio invested in development projects) is correlated with market risk exposure. [2] This paper attempts to fill these gaps by analyzing the investment and return behavior of U.S. open-end private real estate (OPRE) funds from 2004 through 2015.

Managers affect both financial markets and the real economy when they vary their risk exposures and drift from their stated investment strategies (style drift). Consistent with the literature on market-timing, managers can either destroy or create significant wealth depending on how and when they vary their market risk exposure (Bollen and Busse (2001), Huang et al. (2011)). Additionally, many investors decide which funds to invest in based on their stated strategies. As such, investors may have exposures which deviate from their target exposures when funds experience style drift (Barberis and Shleifer (2003), Wermers (2012),

[1] Stabilized properties are more liquid than non-stabilized properties. They are easier to value and there is less due diligence required to acquire them. Additionally, it takes longer to deploy capital into a development property. The majority of the capitalized expenses are realized during the middle of the development process.

[2] Real estate properties being developed are exposed to the following potential risks: entitlement risk, construction risk, leasing and sales risk, operating expense risk, credit risk, partnership risk, capital markets risk, pricing risk, event risk, and valuation risk. To the extent these risks are idiosyncratic, funds do not increase their market risk exposure by increasing their development exposure. However, to the extent these risks are systematic, funds increase their market risk exposure by increasing their development exposure.



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Brown et al. (2009)). Lastly, real estate funds can either amplify or dampen economic cycles depending on whether they invest in development activities procyclically or countercyclically.

Economists have had limited ability to analyze development exposure and the potential causes of style drift due to data limitations. To overcome these challenges, I combined three proprietary data sets which provide asset-level and fund-level information for U.S. OPRE funds from 2004 to 2015. The data come from the National Council of Real Estate Investment Fiduciaries (NCREIF) and The Townsend Group (Townsend). This is the first paper to combine the asset-level data from the NCREIF Property Index (NPI) with the fund-level data of the NCREIF Open-end Fund Index (NFI-OE). It is also one of the first papers to combine these unfulfilled subscription and redemption request (queue) data from Townsend. By analyzing the asset holdings of these funds, I am able to evaluate their investments and allocations in both stabilized and non-stabilized assets. This gives me the ability to measure their development exposure and to evaluate how this influences their market risk exposure. Additionally, it gives me the ability to evaluate which factors influence their holdings and risk exposures.

First, I find that development exposure is a time-varying fund characteristic that explains both cross-sectional and time-series return variation (Lewellen (1999) and Berk et al. (1999)). While prior research addresses the need to adjust returns for property-type, location, and leverage (Riddiough et al. (2005), Pagliari Jr et al. (2005), Ling et al. (2014), Ling and Naranjo (2015), Pagliari Jr (2017), Gang et al. (2017), Pagliari Jr (2020), among others), this is the first paper to provide evidence that development exposure is a characteristic related to systematic risk and, as such, should be addressed when evaluating risk-adjusted performance. While this is consistent with economic intuition, prior research suggests that previously accepted risk characteristics do not always lead to higher realized returns (Fisher and Hartzell (2016), Gang et al. (2017), Pagliari Jr (2020)). [3] In fact, Fisher and Hartzell (2016) find that closed-end private equity funds performed worse on average when they had more development exposure. This paper differs from theirs in that it evaluates the effect of development exposure on risk exposure instead of the average return effect. Addition-

[3]Managers take on many of the following risks when they develop real estate properties: entitlement risk, construction risk, leasing and sales risk, operating expense risk, credit risk, partnership risk, capital market risk, pricing risk, event risk, valuation risk.



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ally, many papers evaluating real estate return performance do not control for development exposure suggesting this may be an important topic to better understand.

Next, I find that OPRE funds invest in development projects procyclically with a lag. OPRE funds nearly doubled their allocations to development projects from 2001 to 2008 before significantly reducing them again by 2011 and then finally doubling them again by 2015. This fluctuation represents roughly $15 billion in construction activities from peak to trough.

Lastly, I find that fund flow pressure is the main driver of time-varying development exposure. Funds invest more in core, stabilized assets when they have large fund flows and queues. A one standard deviation increase in fund flows and net queues leads to 14% and 24% standard deviation increases in the acquisition of stabilized assets respectively. In contrast, changes in fund flows and investment queues do not have a statistical or economic effect on the acquisition of development assets.

Managers influence their development exposure both directly and indirectly when they acquire development properties. They directly influence this exposure as the ratio of stabilized to development properties deviates from their current allocations. Buying properties also indirectly influences future allocations. Once purchased, development properties require more capital expenditures (CapEx) than stabilized properties. Additionally, the natural course for a development property is to evolve into stabilized property. As such, portfolios naturally drift towards stabilization unless managers actively choose to development or redevelop properties. These institutional details lead to my final empirical exercise. The ratio of development to stabilized acquisitions is economically and statistically significant in explaining both the ratio of development to stabilized CapEx and the ratio of property reclassifications from development to stabilized divided by all reclassifications. This is evidence that fund flows and queues influence acquisition activity, CapEx, and property reclassifications. In all, this evidence suggests that fund flow pressure is an important determinant for time-varying development exposure and for procyclical risk taking by OPRE funds.

It is important to recognize the relationship between fund flows and investment choices is not one-way. Investment choices can also influence capital flows. More specifically, investors may be less-risk averse at the top of the market and more risk-averse at the bottom of the



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market. This could provide an alternative explanation for the procyclical development and market risk exposure. In order to evaluate this explanation, I control for both time and fund fixed effects both separately and jointly and find that the relationship between fund flow pressures and investment choices is maintained. This finding suggests time-varying risk preferences is not the primary driver of managers buying more stabilized assets when they they have more fund flows and queues.

It is also important to consider whether funds vary their acquisitions behavior due to time-varying investment opportunities. It is possible investors know which properties managers are planning to buy and that fund flows and queues positively correlate with the size of the expected net present value of the investment (q-theory, Tobin (1969)). While this theory is applicable to corporate finance, it is not applicable to private equity funds. Private equity funds obtain capital commitments before they know the specific investment opportunities of the fund. Prior research suggests capital commitments are based on investment strategies and prior performance (Kaplan and Schoar (2005), Hochberg et al. (2014), Chung et al. (2012), Barber and Yasuda (2017), Brown et al. (2020), Rossi (2019), etc.).

Lastly, I consider whether reaching for yield could be a potential source of the time-varying and procyclical development exposure. If reaching for yield was the dominant motivation, we would expect to see managers purchase more development assets in those times and in those funds with greater positive fund flow pressure. In contrast, I find that funds purchase more stabilized assets when they have greater positive fund flow pressure. Additionally, I find that while funds increase their assets under management (AUM) quicker by purchasing more stabilized assets, they perform worse than those funds which purchased more development assets. In all, this evidence suggests that fund flow pressures drive procyclical development exposure instead of reaching for yield.

This paper is related to the literature on the time-varying market risk exposure of both private real estate funds and publicly traded REITs. Ling and Naranjo (1997) provide evidence that real estate returns are linked to additional macroeconomic risk factors "when sensitivities and risk premia are allowed to vary over time." Sing et al. (2016) provide evidence that publicly traded REITs have time-varying betas and that betas increased from 2000 to 2009. This paper supports the conclusions of those papers and provides direct evidence that



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time-varying market risk exposure is procyclical and that one of the primary channels of time-varying risk exposure is development exposure.

The rest of the paper is outlined as follows. In Section 2, I provide an overview of the OPRE market and risk exposure. In Section 3, I discuss the data and the variables of interest. Section 4 provides the results from my empirical analysis and I conclude in Section 5.

# 2 Open-end Private Real Estate Funds

## 2.1 Market Overview

Commercial Real Estate (CRE) covers all real estate product types other than single family homes and is the primary way institutional investors invest in real estate.[4] By extrapolating previous estimates, I estimate the stock value of U.S. CRE to be around $40.0 trillion as of the fourth quarter 2019 (Geltner (2015) and Florance et al. (2010)). While CRE has historically been a significant sector in the overall economy, its importance as an investment class has grown dramatically over the last 35 years. The average target allocation for institutional investors has grown from around 2% in the early 1980s to between 10% and 12% in 2019. Additionally, allocations are expected to continue increasing.[5]

There are a number of ways institutional investors invest in CRE: direct investment, separate accounts, joint ventures, club deals, commingled funds, and publicly traded REITs. The first five methods of investing in CRE are different ways of investing in the private real estate market while the last is the primary way to invest in the public real estate market, which has a market capitalization of around $1 trillion. My analysis focuses on the risk exposure and risk-taking behavior of OPRE funds over the market cycle.

OPRE funds report their returns quarterly. These returns are based on the capital appreciation of their shares as well as the dividends they distribute. Share values are determined quarterly as the cumulative value of the individual fair value estimates of their underlying

[4]More specifically, Institutional Real Estate, Inc. defines commercial real estate to be, "Buildings or land intended to generate a profit for investors, either from rental income or capital gain. Types of commercial real estate include office buildings, retail properties, industrial properties, apartments and hotels, as well as specialty niche property categories such as healthcare, student housing, senior housing, self-storage, data centers and farmland."

[5]Pension Real Estate Association (PREA) Investment Intentions Survey 2019



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assets, less the sum of their liabilities.[6]

## 2.2 Time-varying Factor Loadings

Development activities and leverage are two fund characteristics believed to increase the market risk exposure of private real estate funds. However, consistent with the intuition from Lewellen (1999), these characteristics vary over time and thus, create time-varying sensitivities to the market return. I model the time-varying loadings of these characteristics in Equations 1 though 4. In doing so, I start with a typical one-factor model, similar to the CAPM, in Equation 1. I represent the decomposition of market risk premium coefficients into their time-varying development exposure and leverage components in Equation 2. By substituting Equation 2 into Equation 1, I obtain the expanded one-factor model reflecting the influence of time-varying development and leverage on market risk exposure as represented by Equation 4.

$$r_{i,t} - r_{f,t} = \tilde{\alpha}_i + \tilde{\beta}_{i,t} \left(r_{m,t} - r_{f,t}\right) + \varepsilon_{i,t} \tag{1}$$

$$\tilde{\beta}_{i,t} = \beta_{i,1} + \beta_{i,2} Development_{i,t-1} + \beta_{i,3} Leverage_{i,t-1} \tag{2}$$

$$r_{i,t} - r_{f,t} = \tilde{\alpha}_i + \left(\beta_{i,1} + \beta_{i,2} Development_{i,t-1} + \beta_{i,3} Leverage_{i,t-1}\right) \left(r_{m,t} - r_{f,t}\right) + \varepsilon_{i,t} \tag{3}$$

$$r_{i,t} - r_{f,t} = \tilde{\alpha}_i + \beta_1 \left(r_{m,t} - r_{f,t}\right) + \beta_2 Development_{i,t-1} \left(r_{m,t} - r_{f,t}\right) + \beta_3 Leverage_{i,t-1} \left(r_{m,t} - r_{f,t}\right) + \varepsilon_{i,t} \tag{4}$$

[6]The Financial Accounting Standards Board (FASB) regulates the valuation of both liquid and illiquid assets through Accounting Standards Codification (ASC) 820 - "Fair Value Measurement." According to FASB ASC 820, the fair value of an asset is "the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date."



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# 3 Data and Summary Statistics

The OPRE data come from NCREIF and Townsend.[7] [8] The NPI is NCREIF's flagship index which tracks the performance of U.S. commercial real estate properties owned by institutional investors. It represents more than $470 billion in 7,225 investment properties as of the fourth quarter 2015. All of the fund-level data except for queue information comes the NCREIF Fund Index – Open End Equity (NFI-OE). The queue data come from Townsend. The empirical analysis is carried out from 2004 through 2015 because the queue data is unavailable prior to 2004. The sample is survivorship bias free and consists of 1,361 fund-quarter observations over 48 quarters for 34 total funds. There is a minimum of 21 funds in each quarter. As of the fourth quarter 2015, the sample represents 34 funds with approximately 3,500 investment properties and $250 billion in Assets Under Management (AUM).

The primary response variables of interest are quarterly values of the Excess Return, Change in Development Allocations, Acquisition Ratio, Conversion Ratio, and Capital Expenditure Ratio. Excess Returns are the quarterly reported returns of the fund net of fees and in excess of the 3-month T-bill. The Change in Development Allocations is defined as the change in the percentage of development assets held by the fund divided by the lagged percentage of development assets held by the fund. The Acquisition Ratio is calculated as the dollar value of stabilized assets purchased divided by the total dollar value of all assets purchased by the fund in a given quarter. The Conversion Ratio is calculated as the dollar value of assets that transitioned from non-stabilized assets to stabilized assets divided by the total dollar value of all assets that either changed from non-stabilized to stabilized or from stabilized to non-stabilized. The Capital Expenditure Ratio is calculated as the dollar value of capital expenditures invested in stabilized assets divided by the total value of capital expenditures invested in properties already owned by the fund.

The primary explanatory variables of interest are quarterly values of the NFI-OE Returns, NPI Returns, NCREIF Transaction Based Index (NTBI) Returns, interactions between the

[7] NCREIF is the leading collector of institutional real estate investment information and provides the primary industry benchmark for institutional investors and represents roughly $500 billion in assets under management as of the fourth quarter 2015.

[8] The Townsend Group is the largest real estate advisor to institutional investors in the world with roughly $270 billion in assets under management as of the fourth quarter 2015.



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non-stabilized and stabilized allocations with the NFI-OE Return, the Acquisition Ratio, the Conversion Ratio, Capital Expenditure Ratio, Fund Flows, and Net Queues. All return values are evaluated in excess of the 3-month T-bill rate. Fund flows are defined as the total net assets less the lagged total net assets times the return on the lagged total net assets all divided by the lagged total net assets. Net queue is the difference between the unfulfilled subscription and redemption requests (subscription and redemption queues) at the end of a given quarter divided by the lagged total net assets.

Subscription and redemption queue data is a combination of three sources provided by Townsend - data I hand collected from quarterly reports, data from the department working directly with OPRE funds, and the department overseeing the general data collection. Where available, I use the hand collected data which ranges from 2008 through 2015. When quarterly reports either did not report queue values or were unavailable, I supplement the hand collected data with data from the department working directly with OPRE funds and then from the department responsible for overall data collection.

I define each of the response and explanatory variables in Section 4 below. Additionally, I trim each of the variables at the 1st and 99th percentiles. Table 1 provides the summary statistics for each of these variables.

# 4 Empirical Results

## 4.1 Market Factors

I start by analyzing which private real estate index provides the best proxy for the OPRE market. In doing so, I first evaluate three private real estate market indexes as potential proxies - the NPI, the NTBI, and the NFI-OE. I then analyze two public market proxies - the market return (as proxied by the Fama French market return) and the publicly traded REIT market (as proxied by FTSE NAREIT Index return).

Table 2 provides the results from analyzing which return series best proxies the OPRE market for the funds I evaluate. Panel A shows the results from my analysis on the private real estate proxies. As shown, all three private real estate indexes are independently significant in explaining fund returns. However, the explanatory power of the NFI-OE returns subsumes



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the the explanatory power of the NPI and NTBI returns when all three are included in the same regression. Panel B reports the results from analyzing the the explanatory power of private real estate returns combined with public market returns and public real estate returns, evaluated separately. The NFI-OE returns are found to similarly subsume the explanatory power of the public market returns as well. The lagged FTSE NAREIT returns, however, add some explanatory power to the NFI-OE returns from a statistical perspective, but not from an economic perspective. In all, this evidence suggests that the NFI-OE is the best proxy for the OPRE funds I evaluate. This makes sense, given that the NFI-OE is a value-weighted index consisting of most of the funds I evaluate.

It is important to note that the NFI-OE is not a traded factor. However, it is likely to be the best proxy for the market return when considering the return generating processes of these funds since it is the index that best explains the return variation of the funds. It also makes sense to use a non-traded index as a market proxy given that most institutional investors benchmark their returns to one of these non-traded indexes.

## 4.2 Time-varying Factor Loadings and Fund Characteristics

Next, I examine the ability of development exposure and leverage to explain private real estate return variation. In order to do this, I follow the intuition of Lewellen (1999) that suggests market risk exposure and factor loadings are time-varying. As such, I expand the market factor loading of the one-factor model to include two time-varying fund characteristics, as shown in Equations 1 to 4.

Consistent with the logic from Section 2.2, Equation 4 is the the primary regression equation of interest. Table 3 provides the results from this analysis. As shown, lagged development allocations and lagged leverage are both statistically and economically significant in explaining both the time-series and cross-sectional return variation of OPRE returns.

## 4.3 Development Exposure over the Market Cycle

Next, I evaluate the market risk exposure of OPRE funds over the market cycle. Figure 1 provides a graphical representation of this analysis while Table 4 provides the empirical results. As shown, OPRE funds have lagged procyclical development exposure. There is



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an approximate four to eight quarter lag between the market cycle and the market risk exposure. While there is a lag in the actual exposure, the development decisions are likely to be more closely aligned with the market cycle given that construction costs are incurred many months after the decision to purchase and invest in a develop project.

## 4.4 Development Allocation Drivers

I next examine the possibility that time-varying development exposure can be explained by either reaching for yield or fund flow pressures. If reaching for yield drives this behavior, the regression coefficient between capital commitments and acquiring development assets should be positive and larger than the coefficient on stabilized acquisitions. However, if time-varying development exposure is due to fund flow pressures, the coefficient between capital commitments and acquiring stabilized assets should be positive and larger than the coefficient on development acquisitions.

Tables 5 through 9 provide the results from my analysis on the drivers of time-varying development exposure. Table 5 provides the results from my analysis on the fund behavior that mechanically changes their development exposure - acquisition activity, asset conversions, and CapEx. Tables 6, 7, and 8 provide the results from my analysis on the effect of capital flow pressures on acquisition activities, asset conversions, and CapEx respectively.

As shown in Table 5, the ratios of fund acquisitions, capital expenditures, and property conversions are both statistically and economically significant in explaining the changes in fund development exposure. As shown in Table 6, both realized and pent-up capital flows are significant in explaining the acquisitions of stabilized and non-stabilized assets. The greater the capital committed to a fund, the more the fund buys stabilized assets. When funds have positive fund flows and flow pressures, the greater the pressures the more stabilized assets they buy. However, as positive fund flow pressures decrease they disproportionately buy fewer stabilized assets and more development assets. As fund flows and flow pressures turn negative, they stop buying assets and development assets convert to core, stabilized assets over time. As fund flows turn positive again and flow pressures are strong, funds again disproportionately buy more stabilized assets than development assets.

Based on economic intuition, lagged acquisition ratios are likely to also determine both



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the capital expenditures and conversion ratios. I test this intuition and provide the results in Tables 7 and 8. Consistent with this intuition, I find that lagged acquisitions determine both the relative ratios of capital expenditures and conversions. The more development projects the fund acquires the more development capital expenditures it will have and the more properties that will eventually be converted from development assets to stabilized assets.

Lastly, I test whether investors are better off by funds having procyclical risk exposure. Specifically, I compare the returns of those funds that invested more in development assets to those that invested more in stabilized assets during the early stages of the recovery (2010 through 2012). In doing so, I find that those funds which invested more in development projects did better. I also find that there is a direct relation between the funds that purchased stabilized assets over this time and their investor queues and fund flows. In all, these results provide further evidence suggesting that funds purchase more liquid, safe assets in order to place capital quicker while at the same time harming their existing investors by removing their market risk exposure at the time when it would be the most beneficial.

# 5 Conclusion

This paper provides new evidence on the determinants of private real estate returns and market risk exposure and how those exposures evolve over the market cycle. I document that development exposure is an important factor influencing private real estate returns. I also document that OPRE funds have time-varying and procyclical market risk exposure through their development activities. Fund allocations to development projects follow the market cycle with a four to eight quarter lag such that funds have the greatest amount of development exposure just after the top of the market and the lowest just after the bottom of the market.

Additionally, I provide evidence that fund flow pressure is a primary driver of this time-varying, procyclical behavior. Funds with greater capital commitments acquire a greater portion of stabilized assets and a smaller portion of development assets. This enables them to place the capital quicker but it also provides lower returns to their existing investors by reducing the market risk exposure when it is the most beneficial. Fund managers further influ-



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ence development allocations by purchasing development properties as they simultaneously commit future investment into these properties. Lastly, their allocations are additionally affected as properties naturally become stabilized through the development process.



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**Table 1**
## Summary Statistics

This table presents the summary statistics for the 34 open-ended private real estate funds in my sample from January 2004 through December 2015. Excess Returns are the quarterly net of fee returns reported by the funds less the 3-month T-bill interest rate. Stabilized assets are those reported as being in a stabilized lifecycle. Development assets are those reported as being in one of the following lifecycle categories: conversion, development, expansion, initial leasing, pre-development, or renovation. Fund Flow is the capital flow into the fund during a given quarter as a percent of the lagged total net assets. It is calculated as: $FF_{i,t} = [TNA_{i,t} - (TNA_{i,t-1} \cdot R_{i,t})] / TNA_{i,t-1}$ . Net Queue is the difference between the unfulfilled capital commitments (investment queue) and the unfulfilled redemption requests (redemption queue) divided by the lagged total net assets.

| stats | Excess Return (Quarterly) | Development Allocation (% AUM) | Leverage (% TNA) | Net Queue (% TNA) | Fund Flow (% TNA) | Acquisition Stabilized (% AUM) | Acquisition Development (% AUM) | Cap Ex Stabilized (% AUM) | Cap Ex Development (% AUM) |
|---|---|---|---|---|---|---|---|---|---|
| mean | 1.57 | 7.09 | 29.37 | 5.99 | 2.49 | 2.28 | 0.41 | 0.46 | 0.39 |
| sd | 4.46 | 8.53 | 13.19 | 14.12 | 5.71 | 7.45 | 1.13 | 0.50 | 0.59 |
| min | -15.62 | 0.00 | 3.61 | -16.10 | -8.49 | -20.40 | -1.85 | -0.03 | 0.00 |
| p5 | -10.19 | 0.00 | 13.03 | -15.64 | -3.52 | -5.38 | -0.19 | 0.13 | 0.00 |
| p10 | -3.41 | 0.00 | 15.20 | -9.98 | -2.01 | -3.03 | 0.00 | 0.18 | 0.00 |
| p25 | 1.69 | 0.69 | 20.20 | 0.00 | -0.45 | -0.68 | 0.00 | 0.25 | 0.00 |
| p50 | 2.75 | 4.49 | 26.00 | 2.00 | 0.74 | 0.16 | 0.00 | 0.34 | 0.14 |
| p75 | 3.61 | 10.11 | 37.32 | 11.22 | 3.65 | 3.65 | 0.32 | 0.49 | 0.53 |
| p90 | 4.69 | 17.52 | 47.50 | 24.31 | 9.64 | 10.10 | 1.41 | 0.74 | 1.15 |
| p95 | 5.45 | 23.76 | 57.03 | 36.02 | 15.59 | 14.98 | 2.52 | 1.03 | 1.75 |
| max | 7.47 | 41.45 | 66.78 | 69.19 | 23.46 | 68.12 | 6.62 | 4.85 | 2.81 |



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**Table 2**

## Private Real Estate Market Factors

This table presents the results from my analysis on the use of different index proxies for the private real estate market. Fund returns are regressed on various contemporaneous and lagged market index returns. Returns are those in excess of the 3-month T-bill rate. The following indexes were considered: the NCREIF Open-end Fund Index (NFI-OE), the NCREIF Transaction Based Index (NTBI), the NCREIF Property Index (NPI), Market Factor (from Kenneth French's website), and the National Association of Real Estate Investment Trusts (NAREIT) - FTSE Russell Index. Standard errors are Newey-West robust, adjusted for heteroskedasticity, and double clustered by fund and quarter. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

$$r_{i,t} = \beta_0 + \beta_1 r_t^{NFI-OE} + \beta_2 r_t^{NTBI} + \beta_3 r_t^{NPI} + \varepsilon_{i,t}$$

$$r_{i,t} = \beta_0 + \beta_1 r_t^{NFI-OE} + \beta_2 r_t^{MKT} + \cdots + \beta_{10} r_{t-8}^{MKT} + \varepsilon_{i,t}$$

| Panel A: Private Market Indexes | | | | | Panel B: Private and Public Market Indexes | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Equity Market | | NAREIT | |
| $r_t^{NFI-OE}$ | 0.936*** | | | 1.034*** | $r_t^{NFI-OE}$ | | 0.940*** | | 0.891*** |
| $r_t^{NTBI}$ | | 0.176*** | | 0.010 | $r_t^{Public}$ | 0.046 | -0.000 | 0.059* | 0.000 |
| $r_t^{NPI}$ | | | 0.986*** | -0.097 | $r_{t-1}^{Public}$ | 0.074** | 0.000 | 0.075** | 0.005 |
| | | | | | $r_{t-2}^{Public}$ | 0.087*** | 0.001 | 0.095*** | 0.010 |
| | | | | | $r_{t-3}^{Public}$ | 0.100*** | 0.001 | 0.105*** | 0.008 |
| | | | | | $r_{t-4}^{Public}$ | 0.102*** | -0.002 | 0.119*** | 0.015** |
| | | | | | $r_{t-5}^{Public}$ | 0.078*** | -0.000 | 0.083*** | 0.005 |
| | | | | | $r_{t-6}^{Public}$ | 0.058** | 0.004 | 0.068*** | 0.009** |
| | | | | | $r_{t-7}^{Public}$ | 0.037 | 0.005 | 0.053*** | 0.008*** |
| | | | | | $r_{t-8}^{Public}$ | 0.029 | 0.005 | 0.045*** | 0.007** |
| N | 3,533 | 3,090 | 3,533 | 3,090 | | 3,435 | 3,435 | 3,435 | 3,435 |
| $R^2$ | 0.64 | 0.09 | 0.63 | 0.66 | | 0.24 | 0.64 | 0.38 | 0.65 |



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## Table 3
## Time-varying Factor Loadings

This table presents the results from my analysis on the relations between development allocations, leverage, and market risk exposure. Fund returns in excess of the 3-month T-bill rate are regressed on the contemporaneous NFI-OE Index returns as well as its interactions with two lagged fund characteristics (development allocation and leverage). The development allocation is the weighted average of all assets in the portfolio of the fund in one of the following lifecycle categories: conversion, development, expansion, initial leasing, pre-development, or renovation. Standard errors are Newey-West robust, adjusted for heteroskedasticity, and double clustered by fund and quarter. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

$$r_{i,t} = \alpha_i + \beta_1 r_{m,t} + \beta_2 Development_{i,t-1} \cdot r_{m,t} + \beta_3 Leverage_{i,t-1} \cdot r_{m,t} + \varepsilon_{i,t}$$

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $r_t^{NFI-OE}$ | 88.634*** | 86.550*** | | 65.085*** | 58.774*** | | 64.444*** | 57.396*** | |
| | (25.58) | (27.93) | | (7.18) | (6.66) | | (7.05) | (7.11) | |
| $r_t^{NFI-OE} \cdot Development_{i,t-1}$ | 160.631*** | 196.779*** | 149.173*** | | | | 95.764*** | 118.235*** | 94.017*** |
| | (3.36) | (4.39) | (3.43) | | | | (3.07) | (8.08) | (3.09) |
| $r_t^{NFI-OE} \cdot Leverage_{i,t-1}$ | | | | 108.561*** | 129.809*** | 101.740*** | 93.002*** | 112.326*** | 86.465*** |
| | | | | (3.72) | (4.50) | (3.70) | (3.43) | (4.25) | (3.37) |
| Fund f.e. | No | Yes | No | No | Yes | No | No | Yes | No |
| Time f.e. | No | No | Yes | No | No | Yes | No | No | Yes |
| N | 1,183 | 1,183 | 1,183 | 1,183 | 1,183 | 1,183 | 1,183 | 1,183 | 1,183 |
| $R^2$ | 0.85 | 0.86 | 0.85 | 0.85 | 0.87 | 0.86 | 0.86 | 0.87 | 0.86 |



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**Table 4**

## Development Exposure over the Market Cycle

This table presents the results from my analysis on the variation in development allocations over the market cycle. Percent changes in development allocations are regressed on lagged NFI-OE Index values. Development assets are those reported as being in one of the following lifecycle categories: conversion, development, expansion, initial leasing, pre-development, or renovation. Standard errors are Newey-West robust, adjusted for heteroskedasticity, and double clustered by fund and quarter. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

$$\Delta Development\ Exposure_{i,t} = \beta_0 + \beta_1 r_{t-4}^{NFI-OE} + \beta_2 r_{t-8}^{NFI-OE} + \varepsilon_{i,t}$$

| | | | | | | |
|---|---|---|---|---|---|---|
| $r_{t-4}^{NFI-OE}$ | 0.302** | 0.258** | | | 0.202** | 0.167*** |
| | (2.14) | (2.56) | | | (2.12) | (20.50) |
| $r_{t-8}^{NFI-OE}$ | | | 0.638*** | 0.614*** | 0.604*** | 0.587*** |
| | | | (4.26) | (4.23) | (5.07) | (4.86) |
| Fund f.e. | No | Yes | No | Yes | No | Yes |
| Time f.e. | No | No | No | No | No | No |
| N | 930 | 929 | 930 | 929 | 930 | 929 |
| $R^2$ | 0.00 | 0.04 | 0.02 | 0.06 | 0.02 | 0.06 |



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**Table 5**

## Change in Risk Exposure and Fund Activities

This table presents the results from my analysis on the drivers of development exposure changes. Stabilized assets are those reported as being in a stabilized lifecycle. Development assets are those reported as being in one of the following lifecycle categories: conversion, development, expansion, initial leasing, pre-development, or renovation. Acquisition, CapEx, Sales, and Conversion Ratios are defined as the ratio of stabilized to both stabilized and development dollars spend on that activity during the quarter. Standard errors are Newey-West robust, adjusted for heteroskedasticity, and double clustered by fund and quarter. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

$$\Delta Development\ Exposure_{i,t} = \beta_0 + \beta_1 Acquisition\ Ratio_{i,t} + \beta_2 Cap\ Ex\ Ratio_{i,t} + \beta_3 Sales\ Ratio_{i,t} + \beta_4 Conversion\ Ratio_{i,t} + \varepsilon_{i,t}$$

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Acquisition Ratio*$_{i,t}$ | -0.160*** | -0.112*** | | | | | | | -0.050 | -0.104** | -0.026 | -0.088** |
| | (-8.76) | (-6.22) | | | | | | | (-1.50) | (-2.63) | (-0.83) | (-2.84) |
| *Cap Ex Ratio*$_{i,t}$ | | | -0.179*** | -0.114*** | | | | | -0.212*** | -0.268*** | -0.111 | -0.151** |
| | | | (-5.38) | (-4.32) | | | | | (-4.15) | (-6.73) | (-1.63) | (-2.69) |
| *Sales Ratio*$_{i,t}$ | | | | | 0.089** | 0.088** | | | 0.013 | -0.013 | 0.012 | -0.011 |
| | | | | | (2.20) | (2.29) | | | (0.38) | (-0.36) | (0.24) | (-0.22) |
| *Conversion Ratio*$_{i,t}$ | | | | | | | -0.407*** | -0.377*** | -0.325*** | -0.297*** | -0.324*** | -0.321*** |
| | | | | | | | (-6.99) | (-7.95) | (-6.70) | (-5.50) | (-4.12) | (-4.63) |
| Fund f.e. | Yes | No | Yes | No | Yes | No | Yes | No | No | Yes | No | Yes |
| Time f.e. | No | Yes | No | Yes | No | Yes | No | Yes | No | No | Yes | Yes |
| N | 688 | 689 | 961 | 960 | 657 | 656 | 340 | 342 | 224 | 217 | 217 | 210 |
| $R^2$ | 0.11 | 0.13 | 0.09 | 0.11 | 0.06 | 0.12 | 0.34 | 0.38 | 0.24 | 0.34 | 0.38 | 0.47 |

**Table 6**
## Investor Flows and Stabilized Acquisitions

This table presents the results from my analysis on the relation between stabilized and development acquisitions and capital flows. Stabilized assets are those reported as being in a stabilized lifecycle. Development assets are those reported as being in one of the following lifecycle categories: conversion, development, expansion, initial leasing, pre-development, or renovation. Acquisition ratio is the value of stabilized assets acquired in a given quarter divided by the total value of properties acquired in that quarter. Net queue is the difference between the unfulfilled subscription and redemption requests (subscription and redemption queues) at the end of a given quarter. Fund flows are defined as the total net assets less the lagged total net assets times the return on the lagged total net assets all divided by the lagged total net assets. Standard errors are Newey-West robust, adjusted for heteroskedasticity, and double clustered by fund and quarter. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

$$Acquisition\ Ratio_{i,t} = \beta_0 + \beta_1 Net\ Queue_{i,t} + \beta_2 Fund\ Flow_{i,t} + \varepsilon_{i,t}$$

$$Stabilized\ Acquisitions_{i,t} = \beta_0 + \beta_1 Net\ Queue_{i,t} + \beta_2 Fund\ Flow_{i,t} + \varepsilon_{i,t}$$

$$Development\ Acquisitions_{i,t} = \beta_0 + \beta_1 Net\ Queue_{i,t} + \beta_2 Fund\ Flow_{i,t} + \varepsilon_{i,t}$$

| | Acquisition Ratio | | Stabilized Acquisitions | | Development Acquisitions | |
|---|---|---|---|---|---|---|
| $Net\ Queue_{i,t}$ | 0.559*** | 0.268** | 0.129*** | 0.073** | -0.002 | 0.002 |
| | (4.65) | (2.29) | (5.02) | (2.43) | (-0.76) | (0.46) |
| $Fund\ Flow_{i,t}$ | 0.179 | 0.819*** | 0.181*** | 0.213*** | 0.009 | -0.006 |
| | (0.95) | (4.37) | (3.01) | (4.14) | (1.00) | (-0.73) |
| Fund f.e. | Yes | No | Yes | No | Yes | No |
| Time f.e. | No | Yes | No | Yes | No | Yes |
| N | 768 | 769 | 1,044 | 1,044 | 1,044 | 1,044 |
| $R^2$ | 0.32 | 0.13 | 0.16 | 0.19 | 0.16 | 0.05 |



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**Table 7**

## Development Conversions and Lagged Acquisitions

This table presents the results from my analysis on the relation between stabilized and development conversions and lagged stabilized and development acquisitions. Stabilized assets are those reported as being in a stabilized lifecycle. Development assets are those reported as being in one of the following lifecycle categories: conversion, development, expansion, initial leasing, pre-development, or renovation. Conversion ratio is the value of assets converted from a development lifecycle to a stabilized lifecycle in a given quarter divided by the total value of properties converted either from development to stabilized or stabilized to development in that quarter. Stabilized and development acquisitions are the respective percentage of assets acquired in a given quarter divided by the total value of properties in that quarter. Standard errors are Newey-West robust, adjusted for heteroskedasticity, and double clustered by fund and quarter. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

$$ConversionRatio_{i,t} = \beta_0 + \beta_1 StabilizedAcquisitions_{i,t-4} + \beta_2 DevelopmentAcquisitions_{i,t-4} + \varepsilon_{i,t}$$

| | | | | |
|---|---|---|---|---|
| *Stabilized Acquisitions*$_{i,t-4}$ | -0.353 | -0.321 | -0.289 | -0.224 |
| | (-0.91) | (-0.94) | (-0.81) | (-0.77) |
| *Development Acquisitions*$_{i,t-4}$ | 2.065* | 1.853** | 2.025** | 2.106*** |
| | (1.97) | (2.63) | (2.18) | (3.45) |
| Fund f.e. | No | Yes | No | Yes |
| Time f.e. | No | No | Yes | Yes |
| N | 336 | 332 | 333 | 329 |
| $R^2$ | 0.01 | 0.22 | 0.20 | 0.40 |



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**Table 8**

## Capital Expenditures and Lagged Acquisitions

This table presents the results from my analysis on the relation between stabilized and development capital expenditures and lagged stabilized and development acquisitions. Stabilized assets are those reported as being in a stabilized lifecycle. Development assets are those reported as being in one of the following lifecycle categories: conversion, development, expansion, initial leasing, pre-development, or renovation. Cap Ex Ratio is the value of assets converted from a development lifecycle to a stabilized lifecycle in a given quarter divided by the total value of properties converted either from development to stabilized or stabilized to development in that quarter. Stabilized and development acquisitions are the respective percentage of assets acquired in a given quarter divided by the total value of properties in that quarter. Standard errors are Newey-West robust, adjusted for heteroskedasticity, and double clustered by fund and quarter. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

$$CapExRatio_{i,t} = \beta_0\beta_0 + \beta_1 StabilizedAcquisitions_{i,t-1} + \beta_2 DevelopmentAcquisitions_{i,t-1} + \varepsilon_{i,t}$$

| | | | | |
|---|---|---|---|---|
| *Stabilized Acquisitions*$_{i,t-1}$ | 0.879*** | 0.368** | 0.823** | -0.028 |
| | (3.95) | (2.68) | (2.74) | (-0.18) |
| *Development Acquisitions*$_{i,t-1}$ | -7.626*** | -3.291*** | -7.859*** | -3.175*** |
| | (-5.61) | (-3.22) | (-5.74) | (-3.27) |
| Fund f.e. | No | Yes | No | Yes |
| Time f.e. | No | No | Yes | Yes |
| N | 1,023 | 1,023 | 1,023 | 1,023 |
| $R^2$ | 0.11 | 0.44 | 0.20 | 0.58 |



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**Table 9**
## Returns and Acquisitions

This table presents the results from my analysis on the relation between fund returns and lagged fund acquisitions during the first three years after the Global Financial Crisis (2010, 2011, and 2012). Stabilized assets are those reported as being in a stabilized lifecycle. Development assets are those reported as being in one of the following lifecycle categories: conversion, development, expansion, initial leasing, pre-development, or renovation. Stabilized and development acquisitions are the respective percentage of assets acquired in a given quarter divided by the total value of properties in that quarter. Standard errors are Newey-West robust, adjusted for heteroskedasticity, and double clustered by fund and quarter. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level respectively.

$$Net\,Return_{i,t} = \beta_0 + \beta_1 Stabilized\,Acquisitions_{i,t-4} + \beta_2 Development\,Acquisitions_{i,t-4} + \varepsilon_{i,t}$$

| | | |
|---|---|---|
| $Stabilized\,Acquisitions_{i,t-4}$ | -0.036** | -0.014 |
| | (-2.58) | (-1.39) |
| $Development\,Acquisitions_{i,t-4}$ | 0.150*** | 0.175*** |
| | (4.43) | (3.54) |
| Fund f.e. | No | No |
| Time f.e. | No | Yes |
| N | 122 | 122 |
| $R^2$ | 0.20 | 0.47 |



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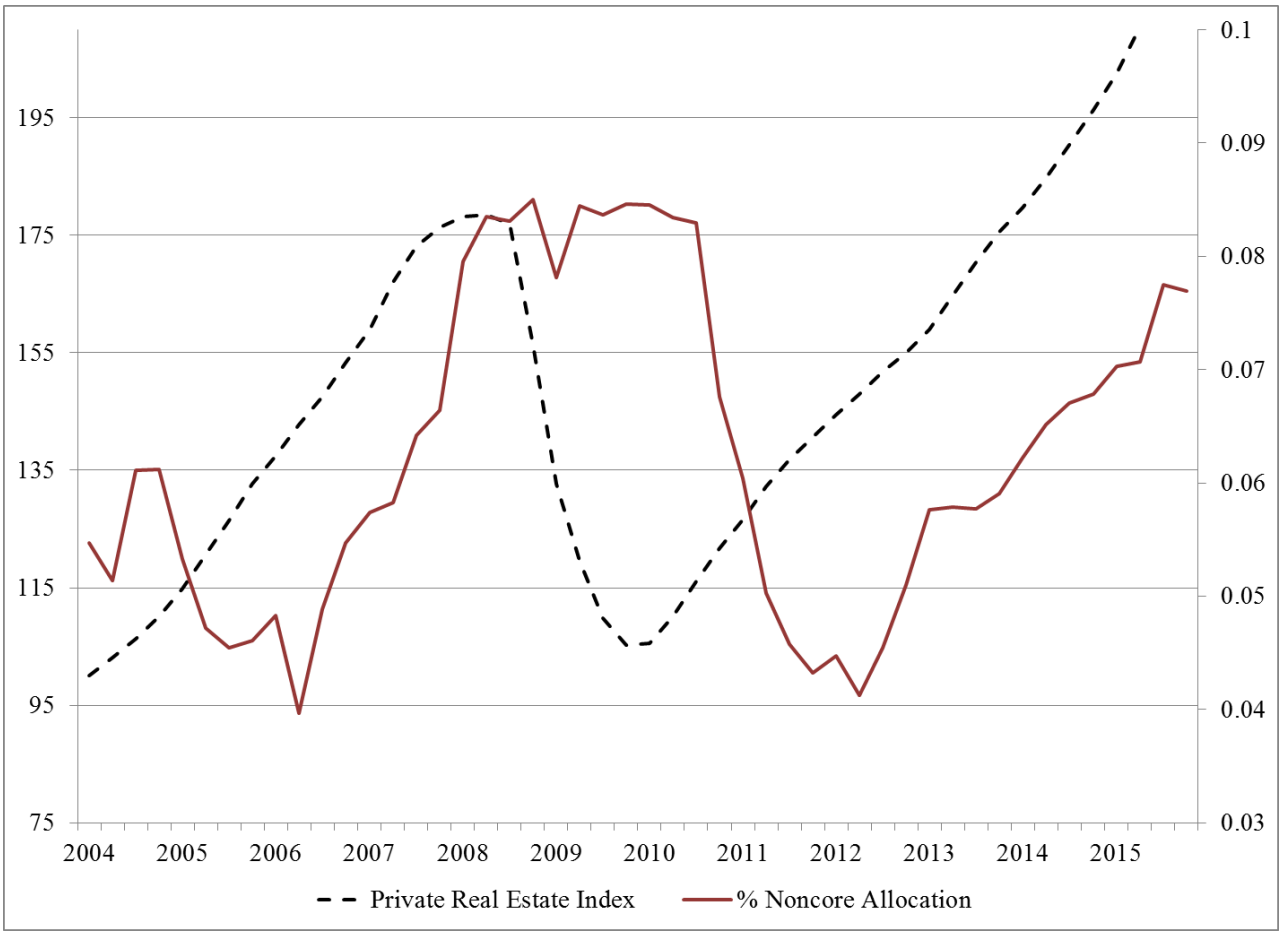


**Figure 1**
**Development Allocations and the Market Cycle**

This figure shows the allocation of open-end private real estate funds in development properties over the market cycle. The development allocation is the dollar-weighted percent of assets reported as being in one of the following lifecycle categories: conversion, development, expansion, initial leasing, pre-development, or renovation. The NCREIF Open-end Fund Index is shown as the dashed line from 2004 through 2015.



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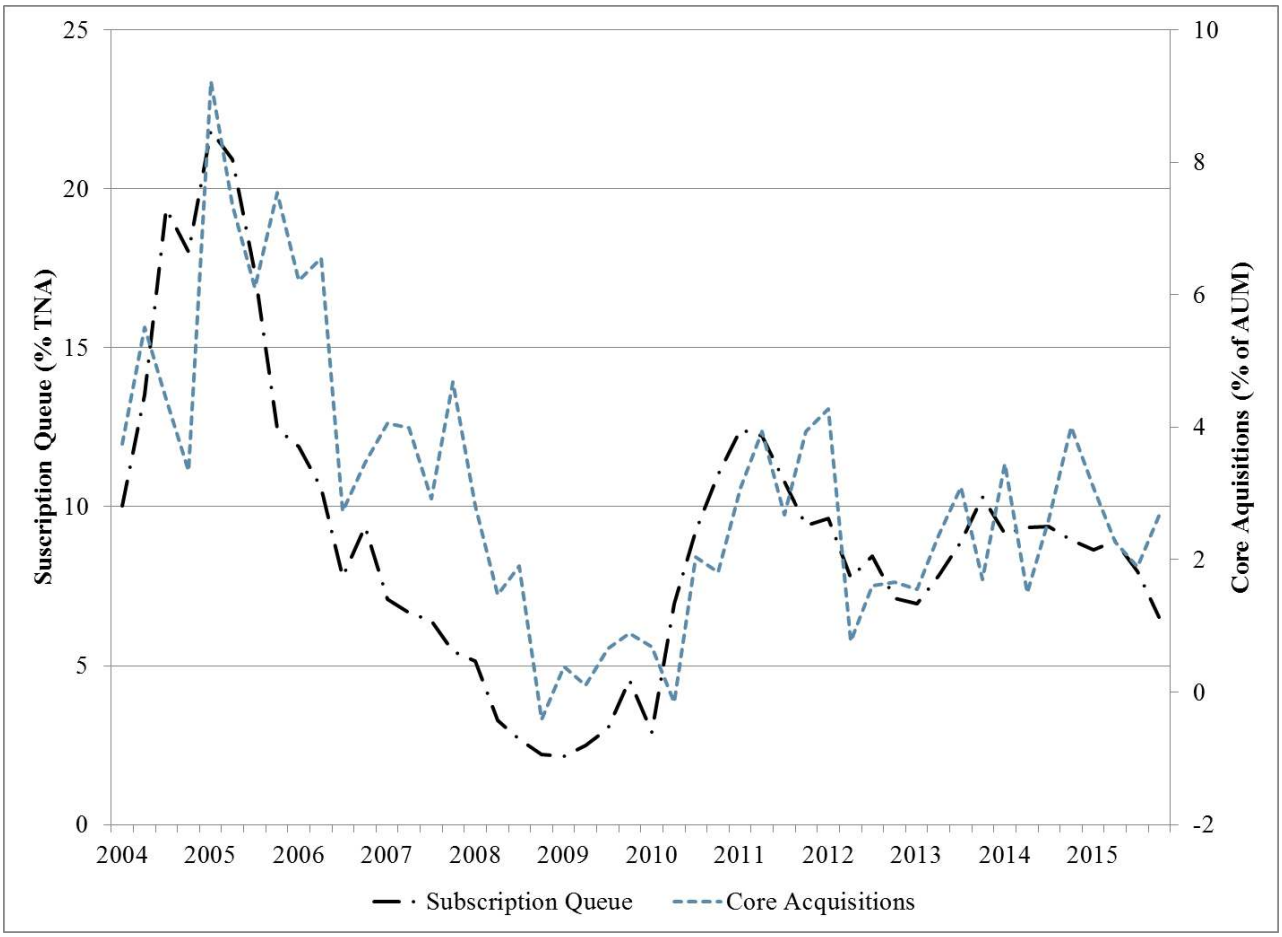


**Figure 2**
**Stabilized Acquisitions and Deposit Queues over Time**

This figure shows the relation between committed capital (subscription queue) into open-end private real estate funds and the acquisition of core, stabilized assets from 2004 through 2015. Deposit queues are calculated quarterly as percentage of total net assets that are committed to enter the fund, but that have not been called. Core properties are those reported as being stabilized.



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