THE INFLUENCE OF CAPITAL FLOWS ON PRIVATE AND PUBLIC EQUITY REAL ESTATE FUNDS

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ABSTRACT

This study aims to explore the impact of capital flows on private and public real estate funds. I bring together work on capital flows, private equity fund performance, and REIT liquidity management to examine the effects of capital flows on real estate markets in the fund level rather than in the aggregate market level with special attention to two sets of relations: 1) the effects of cross-sectional variation of capital flows on returns of private equity real estate funds; 2) the effects of inter-temporal variation of capital flows on the liquidity managements of REITs.

In regards to private equity real estate funds, I find that differential fund growth created by heterogeneous institutional investors determines persistence in fund performance. Utilizing a novel Preqin's data, I develop a data set that shows which type of investors participate in individual private equity real estate funds from 1995 to 2009. The results provide strong evidence that underlying heterogeneity in the sophistication of institutional investors leads to heterogeneity in fund performance and to more performance persistence if sophisticated investors invest in. The funds invested in by sophisticated investors have a weak fund size-performance relation and show strong performance persistence, while the funds invested in by unsophisticated investors have a strong fund size-performance relation and no performance persistence.

Regarding REITs, I find that financially constrained REITs respond to the inter-temporal variation of capital flows, which is represented by time-varying financing conditions, by

changing policies on seasoned equity issuances and credit lines. The results show that the time-varying financing conditions primarily affect the liquidity policies of financially constrained REITs that heavily rely on equity offerings for their liquidity source, but not those of unconstrained REITs that can access relatively diverse funding sources other than equities. The results also suggest that tight financing conditions lead constrained REITs to rely more on equity offerings to repay their credit lines because constrained REITs reserve a large portion of the offering proceeds as an unused credit lines to prepare for unfavorable financing conditions. In addition, the time-varying financing conditions alter the order of accessing credit lines and seasoned equities. As finance costs rise, constrained REITs are more likely to utilize credit lines after raising equities rather than prior to the offerings. This is quite contrary to the traditional bridge loan hypothesis which suggests that REITs prefer to utilize credit lines first in the recession and pay off the drawdown of credit lines later during favorable credit market conditions.

BIOGRAPHICAL SKETCH

Sung Won Suh is an adjunct professor at St. Edward's University. Mr. Suh earned his master's degree in the Baker Program in Real Estate at Cornell University (MPS/RE '06) and a master's degree in architecture in Seoul National University (MS '97). Before coming to Cornell in 2004, he was active real estate practitioner working for Halla Construction and Development Corp. for eight years as a project manager and a research fellow in South Korea. He gained diverse experience in development and investment managing mixed-use and residential development projects. Mr. Suh published The Asset Management Strategy of Real Estate Fund, a book that introduced the new private investment platform of real estate to Korean readers in 2004. His publications, and research, are aimed at helping investors to understand the competitive advantage of new real estate investment instruments, such as REITs and CRREITs (REITs for company restructuring), over other investment vehicles.

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1. CHAPTER ONE

INTRODUCTION

From the early 2000s until the recent market crash, investors have sharply increased their real estate investments through delegated managers, such as private equity real estate funds and REITs. As much as $372 billion in assets, as of June 2013, are under management in U.S.-focused private equity real estate funds. Also REITs raised $84 billion over only one year in 2013 through equity offerings. Concerning the rapid capital inflows in the commercial real estate market, there has been a great deal of academic interest in investigating the effects of capital flows on commercial real estate markets. A handful of studies have examined the effects of aggregate capital flows on real estate asset prices. For instance, Fisher, Ling, and Naranjo (2009) document the short-term positive effects of institutional capital flows on the prices of institutional grade U.S. commercial real estate properties. Ling, Marcato, McAllister (2009) find that capital flows cause a short-term price increase in U.K. private real estate market.

However, the findings on the impact of capital flows on aggregate price movement have not attracted much attention from investors who indirectly invest in real estate assets using investment vehicles such as REITs and private equity real estate funds instead of directly buying or selling real estate properties. Those investors who prefer delegated investments in real estate assets are largely interested in understanding how capital flows affect the performance or management of public and private real estate funds. Regrettably, the previous research on capital flows has generally neglected the important channel through which the money pooled from investors is invested in real estate properties. The effects of capital flows in the fund level instead of the aggregate market level have received much less scholarly attention.

This study attempts to fill this gap by exploring the impact of capital flows on public and private real estate funds. I narrow down the capital flows only to the equity financing from investors to private equity funds and REITs. Specifically, I focus on fundraisings in private equity real estate funds and seasoned equity offering in REITs. When it comes to capital flows, this study considers different dimensions of capital flows in real estate funds in contrast to the prior studies that simply characterize capital flows as an increase or decrease of an aggregate amount of capital inflows into the real estate market.

While I examine the way equity capital is delivered from investors to managers, I find that there are two types of variations in capital flows that may cause interesting fund behaviors in private and public real estate funds: cross-sectional variation and inter-temporal variation. First, the cross-sectional variation in capital flows has an important implication for private equity real estate funds. Since private equity funds are typically closed-end funds, fund managers receive committed capital from investors at the inception of funds and do not accept additional capital until the end of fund life. Therefore, private equity fund mangers have to choose the optimal size of funds concerning how much capital can be allocated from investors into their funds. The problem is the potential conflict of interests between investors and managers in determining an optimal fund size. In general, mangers are inclined to increase fund size if possible to earn more management fees that are collected based on the undrawn committed capital. In contrast, investors prefer to avoid too drastic growth of fund size because it is widely known that diseconomies of scale are pronounced in private equity fund performance (*e.g.,* Kaplan and Schoar 2005; Glode and Green 2011; Hochberg *et al.* 2010). Thus, the cross-sectional distribution of capital from investors into individual funds is potentially associated with the performance of private equity real estate funds.

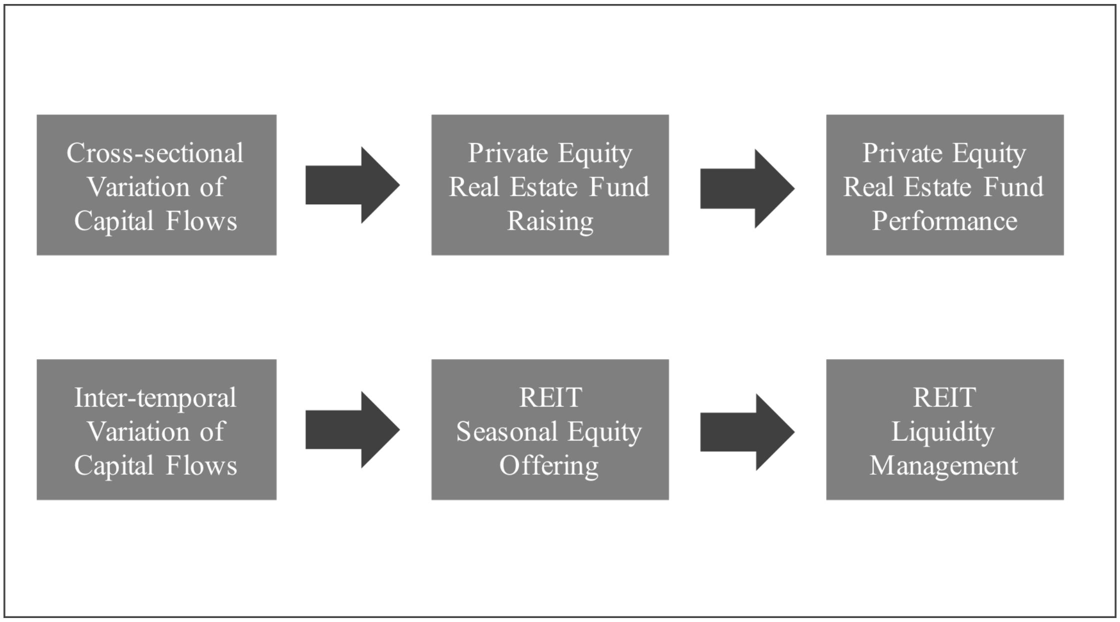

Figure 1.1. Overview of the impacts of capital flows on private equity funds and REITs.

The issue of inter-temporal variation of capital flows is pronounced in REITs. A REIT is a public company that owns real estate properties delivering 90 percent of taxable incomes from the underlying assets to its share holders as dividends. Thus, REITs are limited to save cash from operation and have to deliver new equity capital from seasoned equity offerings to finance their investments. The significant problems that REITs may encounter are that equity financing is not always as easily accessible as they wish. That is, equity financing conditions vary over time as their stock prices move up and down. In response to these time-varying financing condition, REITs have to be concerned about how to manage liquidity to meet their upcoming investment opportunities. Thus, I expect that the inter-temporal variation in capital flows creates unique behavior of REITs to maintain their liquidity.

Taken together, this study seeks to explore the impact of two distinct variations in capital flows on real estate fund behaviors in two different areas as depicted in Figure 1.1: 1) the effects of cross-sectional variation of capital flows on returns of private equity real estate funds; 2) the effects of time-varying equity financing conditions on the liquidity managements of REITs. In the next chapter, I highlight the role of heterogeneous investors who may deliver differential fund flows into individual funds to investigate whether the differential growth in fund size conditioning on past performance affects the returns of private equity real estate funds raised in U.S. during 1995-2009. Previous studies are limited to capture different though not incompatible fund behaviors because they emphasize only the role of sophisticated investors without recognizing the presence of unsophisticated investors. To offset this limitation, I take into account the fact that institutional investors are heterogeneous in the level of investor sophistication. Using a novel Preqin's investor data set that exclusively shows which type of investors participate in individual real estate funds, I seek to find whether the size growth and performance persistence in private equity real estate funds hinges on which type of investors participate in those funds.

In the third chapter, I investigate the impact of time-varying equity financing conditions on liquidity management of REITs. In particular, I explore how financially constrained REITs that face investment opportunities respond to the time-varying financing conditions by changing policies on seasoned equity offerings and credit lines. The interplay between seasoned equity offerings and credit lines are studied in two different aspects. First, I investigate whether the tight financing conditions lead constrained REITs to rely more on equity offerings to repay their credit lines. That is, it is of interest to examine whether constrained REITs reserve a large portion of the offering proceeds as unused credit lines under unfavorable financing conditions. Second, I test whether the financing conditions alter the order of accessing credit lines and seasoned equities. Based on a traditional bridge loan hypothesis, prior studies strongly argue that REITs utilize credit lines first and then pay back the drawdowns of credit lines by raising external capital. I highly suspect that REITs would not follow the way predicted by a traditional bridge loan hypothesis. I take a closer look into the possibility that financially constrained REITs raise seasoned equities first and utilize credit lines after the issuances.

This study, in fact, overarches many separately established literatures: capital flows, private equity performance, equity issuance, and corporate liquidity management. Characterizing capital flows in a broad way opens up new avenues for understanding important aspects of private and public real estate fund behaviors that have not been discovered in each literature.

2. CHAPTER TWO

THE IMPACT OF HETEROGENEOUS INVESTORS ON THE FUND SIZE AND PERFORMANCE OF PRIVATE EQUITY REAL ESTATE FUNDS

2.1. Introduction

It is widely known that private equity firms that typically raise a series of closed-end funds deliver persistent extra returns to investors in their consecutively raised funds. Following Kaplan and Schoar (2005)'s analysis that private equity funds that are raised by the same manager exhibit strong persistence in returns, subsequent studies extensively explored whether there is persistence in performance of venture capital and buyout funds by taking a look at different sample periods and data sources. A few studies on real estate funds also find strong persistence in the performance of real estate funds (*e.g.,* Hahn *et al*., 2005; Tomperi, 2010; Aarts and Baum, 2013).

Despite the significant progress in identifying performance persistence in private equity funds, however, most previous research remains silent on the issue of what causes the persistence in performance of private equity funds. The persistence is quite contrary to the rational perspective that a fund manager that shows a unique skill would attract many investors' interest and then the manager can raise the fees or increase fund size until the persistence disappear. In recent seminal works on the subject of performance persistence in private equity funds, Glode and Green (2011) and Hochberg *et al.* (2010) discover that a manager's behavior to restrict fund size can be an important factor to explain the puzzling performance persistence. They argue that incumbent investors who participate in a private equity funds can cause managers to limit follow-on fund size and that the limited growth of fund size facilitates persistent returns to investors. These explanations are compelling and easy to understand, but empirical findings are not always consistent with their theoretical predictions. For instance, top-performing funds appear to receive more capital from investors in line with their performance increases and also performance persists in bottom performing funds rather than top-performing funds.

Curiously, prior studies have not explored this conflict between theoretical predictions and empirical findings. To fill this void, I take a look at the assumptions on which the theoretical propositions are made and find that the authors hold the assumptions that investors are all sophisticated because the majority of investors in private equity funds are institutions and high net worth individuals. The difference in the level of investor sophistication is commonly ignored. In fact, institutional investors who participate in private equity markets are not uniformly sophisticated. There is strong evidence that they are highly heterogeneous in the level of investor sophistication. Lerner, Schoar, and Wongsunwai (2007) show that institutional investors are very heterogeneous in their sophistication and investment objectives. For instance, they document that certain investor types such as endowments and foundations are the most sophisticated investors because endowments and foundations have superior investment committees and skilled investment managers. In contrast, banks and pension funds are classified as least sophisticated investor types due to rigid decision criteria, lack of knowledge on underlying assets, and incentive structure biased towards pension manager's personal interest.

In this study, I challenge the assumption that investors are all sophisticated to take into account the fact that there are sophisticated and unsophisticated investors among institutional investors who participate in private equity funds. In the presence of sophisticated and unsophisticated investors, I expect that managers' decisions on follow-on fund size would vary. While I agree that managers tend to limit follow-on fund size if their incumbent investors are sophisticated investors, I propose that mangers are more likely to increase follow-on fund size if incumbent investors are unsophisticated investors. What I seek to do in this study is to demonstrate how the manager's response to investors can be finely tuned to reflect the different level of investor sophistication. As Glode and Green (2011) already point out, sophisticated investors who have soft information about managers can replicate incumbent manager's strategies with other managers and thus managers give more profits to those investors by limiting fund size to prevent investors from moving out to other managers. However, they failed to explore the role of unsophisticated investors. Drawing on this missing component, I argue that unsophisticated investors are short of resources to obtain and process private information about incumbent or new managers and thus they are more likely to stay in the incumbent funds if current managers do not violate their investment regulations. If this is the case, managers are expected to show less concern about unsophisticated investors and increase follow-on fund size in favor of maximizing their profits.

This is the first study to investigate how heterogeneous investors affect the fund size and performance of private equity real estate funds. The real estate funds, in specific, provide a unique empirical setting to study this topic in two ways. First, it is only possible in real estate funds to identify which type of investors participate in individual funds. Even the Preqin database that is recognized as the most comprehensive source for private equity funds does not disclose the list of investors for other private equity funds such as venture capital and buyout funds. As such, this study is the first to utilize a novel real estate investor data set that is collected by Preqin but has not been explored in the literature. Second, real estate funds have highly specialized and complex underlying assets compared to those of other private equity funds such as venture capital and buyout funds. Thus, heterogeneity in investor sophistication, that is expected to be more pronounced in real estate funds than others, helps identify sophisticated and unsophisticated investors.

This study comprises two parts. First, I identify the level of sophistication across different types of investors and divide the sample into two subgroups: funds invested in by sophisticated investors and funds invested in by unsophisticated investors. By examining reinvestment decisions across different investor types which include public and private pension funds, foundations, endowments, insurance companies, and others, I find that foundations are strikingly different from other investor types. Foundations have the lowest reinvestment rate compared to others and the funds where foundations decide to reinvest in significantly outperform the funds they decide not to reinvest in. The results suggest that foundations have features of sophisticated investors, but other investor types do not show the same level of sophistication. Based on the findings, I classify funds in which foundations participate as the funds invested in by sophisticated investors, and funds where foundations do not invest in as the funds invested in by unsophisticated investors.

In the second part, I explore whether the two subsamples show different fund dynamics. Specifically, I perform regression analyses to estimate two associations: the relation of fund size to past performance and the relation of current performance to past performance. The results show that the funds where sophisticated investors participate have a weak fund size-past fund return relation and show strong performance persistence, while the funds where unsophisticated investors participate have a strong fund size-prior fund return relation and weak performance persistence.

The rest of the chapter proceeds as follows. Section two reviews the literature. Section three discusses hypotheses. Section four describes how the datasets are constructed showing descriptive statistics of the two constructed datasets. Section five presents the results of regression analyses. The final section offers conclusion and implication of this study.

2.2. Literature Review

In the literature of performance persistence in private equity funds, Glode and Green (2011) and Hochberg *et al*. (2010) recognize the role of sophisticated investors in determining fund size to explain puzzling performance persistence. These papers present theoretical models in which top-performing managers' action to limit fund size drives performance persistence in private equity funds. The intuition is that, if a top performing manager increases the size of follow-on funds too much, the follow-on fund returns decreases because the managers are not able to keep up their resources as much as the follow-on fund size increases. In contrast, if the follow-on fund size is limited, the manager's performance persists. In the theoretical models, sophisticated investors who have soft information about manager abilities or strategies can hold up the top-performing managers to limit fund size. Because managers are afraid of the negative information spillovers or leaking their soft information to other competitors when incumbent investors move out to other managers, managers are willing to give extra profits to the incumbent investors by limiting fund size. Although these theoretical studies provide valuable insights about the causes of performance persistence, they fail to discover the role of unsophisticated investors who may facilitate increasing fund size rather than liming fund size.

In line with the notion that top-performing mangers restrict fund size, many empirical studies of venture capital and buyout funds have debated whether performance persists by utilizing different sample periods and data sources (*e.g.*, Kaplan and Schoar 2005; Phalippou and Gottschalg 2008; Phalippou 2010). Adopting a similar approach to real estate funds, Tomperi (2010) and Aarts and Baum (2013) also explore performance persistence in the private equity real estate funds globally raised during 1990-2009. Both studies use the Preqin database but use different approaches. Tomperi (2010) conducts regression analysis to estimate the correlation between two net IRR returns of consecutively raised funds. Aarts and Baum (2013) use normalized ranks as a performance measure and conduct more comprehensive analyses using contingency tables, cross-product ratios, rank correlation statistics, and regressions.

Even though the two studies in real estate funds present evidence that there is strong performance persistence in private equity real estate funds, they fail to recognize the possibility that managers can promote or weaken performance persistence by making a choice between increasing or limiting fund size. Highlighting only the role of sophisticated investors while ignoring the role of unsophisticated investors, leads to two potential shortcomings in previous empirical findings. First, the persistence is highly sensitive to data source, sample periods, and performance measures. For example, Phalippou (2010) finds no performance persistence in the venture capital funds raised during 1980-1995 when using ex-ante performance measures instead of ex-post measures. Second, persistence is pronounced more in weaker performance than in strong performance. As shown on the contingency table analyses by Aalts and Baum (2013), there is a significant persistence between underperforming funds. In venture capital funds, Phalippou (2010) shows striking results that performance persists mainly between underperforming funds rather than top-performing funds.

The heterogeneity of investors has been studied mainly to account for the difference in the investment performance across different types of investors. Lerner *et al.* (2007) recognize the difference in investment returns across investor types suggesting that investors differ in the level of access to the best funds as well as the level of selection skills. Building on the findings of Lerner *et al.* (2007), Sensoy *et al.* (2014) explore whether comparative advantages of endowments change over time and find endowments' higher returns compared to others have dissipated over time. These studies emphasized the passive role of investors such as selecting good funds, as opposed to the active role such as negotiating with managers to earn a larger share of profits. For instance, they interpret a strong relationship between investments of endowments and low growth of funds as a result of endowments' privileged access to the best funds during 1991-1998. This study expands the literature on the investor heterogeneity by identifying the active role of investors in determining differential size growth of funds.

In the sense that performance persistence and investor heterogeneity are examined together, Phalippou (2010) is the closest work to this study. The author starts with a similar assumption that fund size is differentially determined by whether sophisticated or unsophisticated investors participate. However, the author completely abandons the traditional notion that sophisticated investors force top-performing managers to limit fund size, claiming that sophisticated investors tend to increase the size of top-performing venture capital funds. The author argues that sophisticated investors increase fund size proportionally to past returns and thus there is no persistence in top-performing funds. The findings create serious confusion in the persistence literature. However, it should be noted that the author cannot identify sophisticated investors with actual data and simply assumes that top-performing funds have sophisticated investors and bottom-performing funds have unsophisticated investors. Needless to say, it would be mistaken to assume in that way and the findings are misleading.

Prior studies indicate that characterizing the investors in one way in terms of determining fund size limits our ability to explain the complicated private equity market structure. Thus, this study aims to explain many puzzling results in the previous studies by accounting for the two discrete fund behaviors of limiting or increasing fund size depending on whom their investors are.

2.3. Hypotheses

In this study, I propose the possibility that sophisticated investors and unsophisticated investors lead top-performing managers to take different choices in determining follow-on fund size: limiting fund size to deliver extra profits to investors or increasing fund size to maximize manager's returns. In the theoretical framework of Green and Glode (2008), and Hochberg *et al.* (2010), investors are all sophisticated and thus top-performing managers are assumed to limit fund size exclusively. The single line in Figure 2.1-A represents the hypothesis that the managers in top-performing funds have only one option to limit the size of follow-on funds. In contrast, I hypothesize that there are two ways in which managers can decide whether to limit or increase the follow-on fund size, depending on which type of investors the managers have in their funds. For example, if the funds are backed by sophisticated investors, the managers are inclined to limit the size of follow-on funds because managers recognize the higher risks that sophisticated investors may steal their strategies or spill negative information to other investors. Conversely, if the funds are backed by unsophisticated investors, the funds are more likely to increase the size of follow-on funds because managers are less concerned about unsophisticated investors than sophisticated investors. The two lines in Figure 2.1-B represents the two options that top-performing managers have in determining the size of follow-on fund.

With the assumption that sophisticated and unsophisticated investors place opposing forces on the size growth of follow-on funds, performance persistence can be either strengthened or weakened. For instance, if top-performing managers restrict their fund growth in the follow-

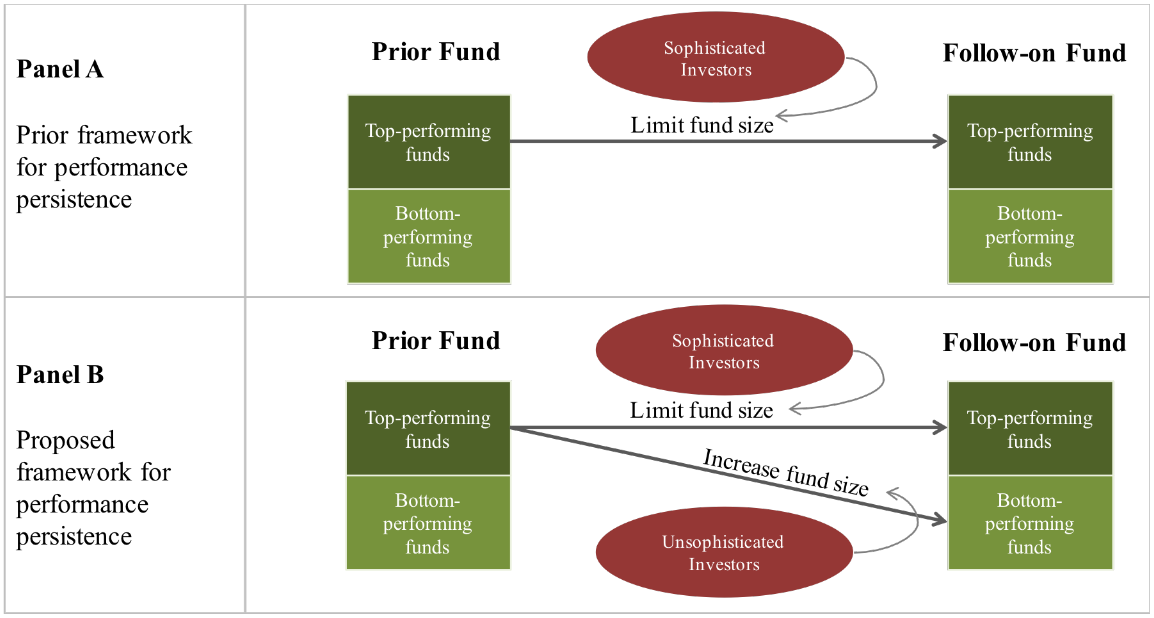

Figure 2.1. The figure shows a conceptual framework for the growth of fund size and performance persistence in private equity funds. Panel A exhibits a framework proposed in the prior studies. Panel B shows a framework suggested in this study.

on funds, performance is more likely to persist as predicted by Glode and Green (2011), and Hochberg *et al.* (2010). If top-performing managers do not limit their follow-on fund size, performance persistence should be undermined due to diseconomies of scale.

In sum, this study tests whether heterogeneity in investor sophistication helps explain the several anomalies that prior studies have found in the relation of fund size to past performance and performance persistence. The two discrete fund dynamics in the presence of heterogeneous investors can be summarized in the form of testable hypotheses for regression analyses.

Hypothesis 1: The funds backed by sophisticated investors show a weak relation between fund size and prior fund performance and strong performance persistence because the limited size growth contributes to the performance persistence of two successive funds.

Hypothesis 2: The funds backed by unsophisticated investors show a strong relation between fund size and prior fund performance and weak performance persistence because the strong size growth of follow-on funds has adverse effects on fund returns and by consequence, weaken the performance persistence of two successive funds.

To test above two hypotheses, I generally follow the specification of regression models that are utilized by Kaplan and Schoar (2005) and subsequent studies to make it convenient to compare the results of this study with the findings of prior studies.

The relation of fund size to past performance is written as:

$$Size_{it} = \alpha + \alpha_t + \beta_1 Return_{it\text{-}1} + \beta_2 Size_{it\text{-}1} + \beta_3 Fund\ Sequnece_{it} + \beta_4 StrategyDummy_i + \varepsilon_{it} \tag{1}$$

The performance persistence is estimated as follows:

$$Return_{it} = \alpha + \alpha_t + \beta_1 Return_{it\text{-}1} + \beta_2 Size_{it} + \beta_3 Fund\ Sequence_{it} + \beta_4 StrategyDummy_i + \varepsilon_{it} \tag{2}$$

$Return_{it}$ is the net internal rate of return (Net IRR) earned by investors after detecting all fees and carried interest. $Size_{it}$ is measured as the natural logarithm of committed capital to a fund. $Fund\ Sequence_{it}$ is the natural logarithm of sequence number of a fund. $StrategyDummy$ is a dummy equal to 1 if the fund's strategy is opportunistic and 0 if the fund's strategy is value-added. α_t is a vintage year effect dummy. The fixed effects of vintage year are controlled because fund size and performance dramatically changes depending on the market conditions when the funds are raised. I also include the strategy dummy variable since funds have varying risk profiles depending on their primary investment strategies such as opportunistic and value-added.

In the previous research, the regression model (1) is primarily utilized to find how much capital is allocated to follow-on funds given past performance of prior funds. Most prior studies find positive association between fund size and past performance, suggesting that rational investors are willing to allocate more money to the better performing managers. To challenge this monotonic relation between fund size and past performance, I estimate fund size-performance relation in two subsamples: funds invested by unsophisticated investors and funds invested by sophisticated investors. If capital flows into the subsequent funds of better performing managers are allowed without resistance by unsophisticated investors, the coefficient of prior return is expected to be positive. If capital flows are restricted by sophisticated investors, the coefficient of prior return is expected to be not significantly different from zero.

The regression model (2) that is designed to identify persistence of private equity performance estimates the association between follow-on fund return and prior fund return. If there is performance persistence between funds that are raised by the same manager, the lagged return variable is expected to have a positive coefficient. The two control variables of size and fund sequence are expected to be positive since it is widely known that larger and higher sequence numbered funds have higher returns. Prior studies have modified the regression model (2) extensively by adding various control variables to examine whether performance persistence is sustainable in diverse conditions. However, the primary interest of this study is to find whether the two different groups of funds that are invested in by sophisticated investors or unsophisticated investors exhibit variation in performance persistence. To unveil different levels of performance persistence, I estimate the regression model (2) respectively for two subsamples: funds invested in by sophisticated investors and funds invested in by unsophisticated investors. If sophisticated investors suppress size growth and the limited fund size promotes performance persistence, the lagged return variable is expected to be positive. If unsophisticated investors allow size growth and the relatively larger fund size hinder performance persistence, the lagged return variable is expected to be less significant.

2.4. Data

This study focuses on private equity real estate funds raised in US during 1995 – 2009. The data for this study are pulled from Preqin's real estate online services, which has been considered as the most comprehensive data source for private equity real estate markets by practitioners, but rarely utilized in the academic research on private equity real estate funds[1].

There are two main advantages of using Preqin data, compared to other sources such as Burgiss, specifically for this study. First, Preqin provides detailed information about general partners (GPs) for each fund while other sources usually hide GP's name to protect the confidentiality of private information. Therefore, the past performance can be linked to the fund size and performance of follow-on fund by tracking the family of funds managed by the same managing firm. Second, Preqin provides the identities of underlying investors for funds. Even though the data is limited to cover a complete list of investors, it allows this study to find differences in the investment patterns across investor types.

However, there are several issues raised in the literature, in particular related to performance measures of Preqin data. First, Preqin provides three performance measures: net return after fee and carried interest, mutiple of invested capital, and excess net returns adjusted to a benchmark index. All three measures represent ex-post performance and the studies based on the ex-post performance measures tend to exaggerate the performance persistence Phalippou (2010). However, this study is not to estimate the precise sensitivity of past fund return to follow-on fund return, but to compare the sensitivities of performance persistence between two subsamples: funds backed by sophisticated investors and funds backed by unsophisticated investors. Therefore, the slightly elevated sensitivity does not invalidate the findings in this

1 Tomperi (2010) and Aarts & Baum (2013) source their data from Preqin to study the performance of private equity real estate funds globally raised during 1990-2009.

study. Another issue is the difference between relative returns and absolute returns. As an alternative measure of performance, PME (public market equivalence) is recently used in the private equity studies with help of data based on cash flows because PME already reflects the effects of varying risk-free rates based on the accurate timing of cash flows. However, this study does not seek to compare the fund returns with other asset classes or measure the precise effects of fund characteristics on fund performance. Since this study aims to compare the difference in the associations of performance persistence, using absolute performance measure is not likely to distort results of analyses.

Dataset Construction

In this study, I construct two separate datasets: one for identifying which investor types are sophisticated or unsophisticated, and the other for performing regression analysis. There are three raw datasets in Preqin real estate database: funds, fund performance, and investors. The funds dataset includes fund characteristics such as manager, vintage year, fund size, primary country, and primary strategy. The performance dataset contains Net IRR, multiple X, difference of Net IRR from benchmark, and percentage of called. The investors dataset provides information about the funds where investors invest, and the managers that investors partner with.

The initial set of observations are pulled from the three datasets with the following criteria:

- Primary strategy: opportunistic and value-added
- Primary target region: U.S.
- Vintage year: 1995-2009
- Fund size: more than $5 million
- No separate accounts
- Fund structure: limited partnership

First, the primary strategy is confined to opportunistic and value-added and the funds with other strategies such as core, core-plus, debt, and distressed are excluded. Because fund performance can be driven by country specific risks and market conditions, I limit the sample to the US funds as opposed to Tomperi (2010) who includes the funds globally raised during 1980--2009. The sample covers the vintage years 1995 to 2009. The funds in vintage year before 1995 are excluded because the number of these funds is significantly lower before 1995 than after 1995. The funds raised after 2010 are also removed because the performance reported within less than 5 years after the fund is raised is likely to be unstable. Regarding the reliability of performance measure in recently raised funds, Tomperi (2010) includes all observations which called percentages are more than 80 percent, but I prefer to limit the sample by vintage years rather than by called percentage. Another reason to drop funds raised after 2010 is that investments in funds raise after 2010 cannot be properly classified in the reinvestment analysis. Since each investment is classified as one of followings: 1) reinvested in follow-on fund; 2) not reinvested in follow-on fund; 3) follow-on fund does not exist, for the funds raised after 2010, it is not clear whether investor stop reinvesting the funds or the follow-on funds are not raised. I drop funds with less than $5 million in capital commitments because those small funds create significant noise in the performance. Finally, separate account funds are excluded because those funds have different governing structure between managers and investors compared to the funds having limited partnership structure.

After the initial screening, the investor dataset is appended with the performance dataset for reinvestment analysis. The merged data for reinvestment analysis includes 4,629 investor-fund observations. During the sample period, the 930 institutional investors, known as limited partners (LPs) invest in 638 funds partnered with 250 managing firms, known as general partners

(GPs). Each observation is recoded for reinvestment status, size growth, and performance of follow-on fund. For the regression analysis, the performance dataset is appended with investor dataset. The number of partnerships across different types of investors in each fund is recorded in the performance dataset. Investors are classified into one of the following types: endowment, foundation, private pension fund, public pension fund, insurance company, bank, asset manager, and other. The combined data for regression analysis includes 474 fund-performance observations.

The last data preparation step is to assign fund sequence number to funds in the two final datasets. To assign accurate fund sequence number is very important in this study because both reinvestment analysis and regression analysis rely on the relationships between past funds and follow-on funds. There are two ways to assign fund sequences. One way is to group all funds raised by the same general partner and assign sequential numbers, which has been used for the studies in which fund sequence represents the level of manager's skills. The other way that is chosen for this study is to group funds not only by general partner but also strategy and property type. Large managing firms commonly raise multiple line of funds which have dramatically different risk profiles depending on the primary strategy and target properties. Since this study focuses on the fund family sharing the same strategy and properties, I manually identify the fund name, primary strategy, and primary property type of funds to confirm whether each fund belongs to the group of funds sharing the same strategy and target properties by the particular general partner.

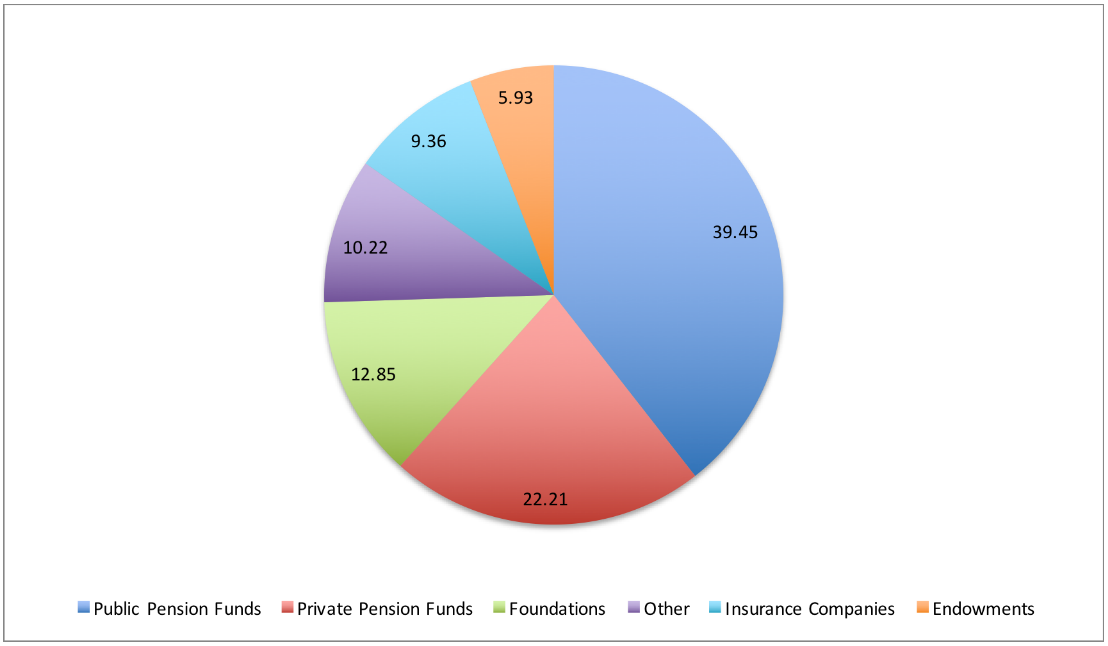

Figure 2.2. The figure shows investments in the sampled funds across different types of investors. There are six types of investors which includes public pension funds, private pension funds, foundations, endowments, insurance companies, and others.

2.5. Descriptive Statistics

There are seven types of institutional investors as Figure 2.2 illustrates. Public and private pension funds account for 62 percent of investments in the private equity real estate funds. About 40 percent of the investments are made by public pension funds and 22 percent of the investments are made by private pension funds. Endowments and foundations represent 19 percent of the total investments in the sample. The remainder of investments are made up of other investor types including banks, insurance companies, and sovereign funds, and etc.

Table 2.1 presents the fund characteristics grouped by the same type of investors. Since endowments, foundations, insurance companies, and private and public pension funds have large differences in organizational structure, and investment objectives, each investor type may have a different set of preferred funds. However, the summary statistics for the sample show that the fund characteristics such as size and sequence are not noticeably different across different investor types. The average size of funds where private and public pension funds invest is slightly larger than the size of funds where endowments and foundations invest ($1,146 million, $1,114 million, $1,097 million, and $1,011 million, respectively). Endowments appear to moderately prefer mature funds, but it is not significant. In terms of investment performance, foundations perform best, but surprisingly, the worst performing group is endowments followed by public pension funds. Foundations show an average extra net IRR of -1.3%, and endowments and public pension funds show an average extra net IRR of -2.8% and -2.2% respectively. However, it is worth noting that the mean performance in Table 2.1 is not the actual returns for investors. The average performance value is based on the strict assumption that investors equally invest their money on each fund.

A simple comparison of the average number of investments with the average number of managers across investors types provides a basic insight into the heterogeneity of investors in making their investment decisions. Figure 2.3 indicates two important patterns. First, private and public pension funds invest more frequently than endowments and foundations because private and public pension funds have much larger capital to allocate than endowments and foundations. Second, private and public pension funds and insurance companies are more likely to expand their real estate allocations through their incumbent managers than foundations and endowments. Even though both foundations and public pension funds have partnerships with about 20 managers, public pension funds have made about twice higher number of investments with the incumbent managers (12.9 vs. 39.5, respectively). The two discrete investment patterns suggest that private and public pension funds more heavily rely on the limited number of managers compared to endowments and foundations.

Table 2.1

Fund Characteristics by Type of Investors

InvestorType	Fund Size (MM$)			Fund Sequence (%)			Excess Net IRR (%)		
	N	Mean	Median	N	Mean	Median	N	Mean	Median
Asset Manager	143	1,072	1,500	143	3.5	2.0	143	-1.5	10.1
Endowments	292	1,097	1,494	292	4.3	2.3	292	-2.8	11.3
Foundations	656	1,011	1,578	656	3.6	2.3	656	-1.3	10.0
Insurance Companies	428	865	1,704	428	3.6	3.4	428	-1.9	10.9
Private Pension Funds	1,110	1,146	1,718	1,110	3.7	2.2	1,110	-1.8	10.5
Public Pension Funds	1,663	1,114	1,779	1,663	3.5	2.2	1,663	-2.2	11.2
Others	337	1,263	2,124	337	3.2	2.3	337	-2.6	10.9
Total	4,629	1,093	1,735	4,629	3.6	2.3	4,629	-2.0	10.8

Note: The table reports a summary of 4,629 investments by 930 investors in 250 funds during 1995-2009.

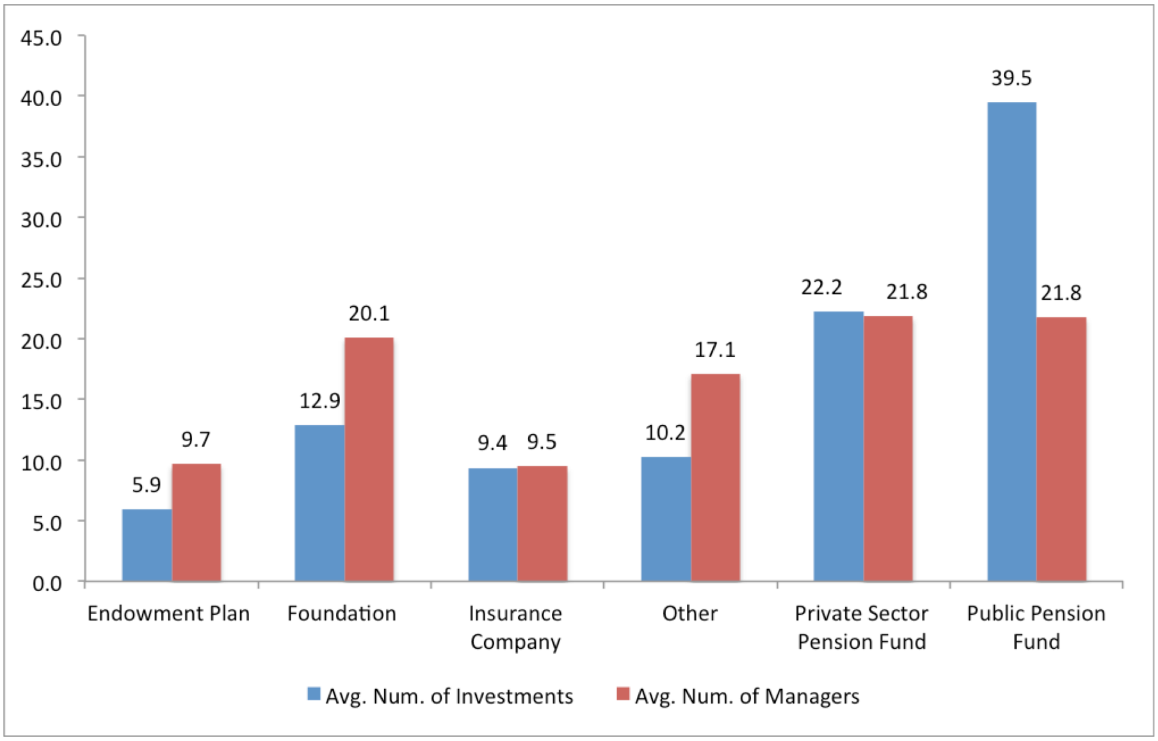

Figure 2.3. The figure shows average number of investments vs. average number of managers across different types of investors. This figure suggests that private and public funds more heavily rely on the limited number of managers compared to endowments and foundations.

The descriptive statistics in Table 2.2 show significant differences between 143 opportunistic funds and 255 value-added funds in the sample. The average size of opportunistic funds is about twice larger than the average size of value-added funds ($840 million vs $381 million, respectively). The value-added funds perform better than opportunistic funds (%10 vs. 7% in average net IRR, respectively). The results suggest that the strategy fixed effect must be controlled in the regression analysis. In addition, figure 2.4 shows that fund performance varies over time, suggesting that a fund performance heavily depends on the vintage year when the funds is raised. This suggests that the year fixed effect must be controlled in the regression analysis.

Figure 2.4. The figure shows historical performance (mean net IRR) of opportunistic and value-added funds.

2.6. Identifying Sophisticated and Unsophisticated Investors

In this section, I identify which investors are sophisticated and unsophisticated investors by examining the reinvestment decisions across different investor types. Following the approach proposed by Lerner *et al.* (2007), I compare reinvestment rates across investor types, and then test whether there are significant differences in follow-on fund returns between the funds reinvested and disregarded by each type of investors. I use mean difference tests to find whether any distinctive difference appears between the two groups of funds separated by reinvestment decisions.

Table 2.2

Fund Size and Fund Performance

Size	N	Mean	Median	Min	Max	StdDev
Total	398	546.46	310	5	13300	959.71
Opportunistic	143	839.22	471	5	13300	1454.27
Value Added	255	381.48	265	9.3	4000	420.16
NetIRR	N	Mean	Median	Min	Max	StdDev
Total	398	8.99	9.65	-53.5	75	14.49
Opportunistic	143	7.22	8.65	-51.9	40	13.01
Value Added	255	10.01	10.35	-53.5	75	15.21
Mutiple X	N	Mean	Median	Min	Max	StdDev
Total	398	1.31	1.30	0.03	4.17	0.54
Opportunistic	143	1.27	1.26	0.08	3.91	0.52
Value Added	255	1.33	1.30	0.03	4.17	0.56
Extra NetIRR	N	Mean	Median	Min	Max	StdDev
Total	398	-0.67	-0.20	-54.2	70.9	12.51
Opportunistic	143	-3.23	-2.05	-54.2	21.7	11.02
Value Added	255	0.81	0.55	-53	70.9	13.08

Note: The table reports descriptive statistics for 143 opportunistic funds and 25 value added funds.

Table 2.3

Reinvestment Rates Across Investor Types

Investor Type	N	mean	p50
Asset Manager	17	0.20	0.00
Endowment Plan	98	0.12	0.00
Foundation	190	0.19	0.00
Insurance Compan	83	0.21	0.00
Private Pension Fund	207	0.22	0.00
Public Pension Fund	210	0.31	0.29
Others	125	0.09	0.00
Total	930	0.21	0.00

Note: The table reports reinvestment rates across different investor types. The sample consists of reinvestment opportunities given to 930 investors in 250 funds during 1995-2009. Reinvestment opportunities are identified by reference to the sequence number of funds that are raised by the same manager.

Table 2.3 reports reinvestment rates across different investor types. Private and public pension funds reinvest in the follow-on funds more frequently than foundations and endowments. Endowments have the lowest reinvestment rate of 12 percent followed by foundations with reinvestment rate of 19 percent and the public pension funds have the highest reinvestment rate of 31percent. The difference of likelihood to stay in the incumbent partnerships across investor types is more pronounced in the comparison of median reinvestment rates. Only public pension funds have a positive median value of 29 percent, while other investor types have almost zero median values. This implies that more than 50 percent of public pension funds reinvest in the follow-on funds at least one third times in their total investments. These findings indicate that foundations and endowments may have more intensive screening process than private and public pension funds in the reinvestment decisions.

Table 2.4

Reinvestment Decisions by Investors

		Past Fund Mean Net IRR(%)	Successive Fund Mean Net IRR (%)	Mean Size Growth
Endowments	Reinvested	-1.14	-0.19	0.62
	Not reinvested	-3.43	-0.40	0.76
	t-test	-1.3379 *	-0.1253	1.3529
Foundations	Reinvested	-0.61	0.43	0.71
	Not reinvested	-0.70	-1.13	0.63
	t-test	-0.0933	-1.4134 *	-0.7765
Private Pension Funds	Reinvested	-0.51	-0.25	0.68
	Not reinvested	-0.29	0.51	0.50
	t-test	0.3120	0.8605	-2.2392 **
Public Pension Funds	Reinvested	0.15	-0.09	0.88
	Not reinvested	-1.58	-0.63	0.46
	t-test	-3.0269 ***	-0.6898	-3.7991 ***

Note: The table reports characteristics of reinvestment opportunities that are split by whether the investor decided to reinvest or not. Past fund net IRR is the net IRR of the past funds, Successive fund net IRR is the net IRR of the follow-on fund. Size growth is the percentage change in fund size from the past fund to the follow-on fund. P-values from t-tests of differences in the means between reinvested and non-reinvested funds are reported. *significant at 10%; **significant at 5%; ***significant at 1%.

Table 2.4 presents the results of reinvestment decisions. I find that funds in which foundations reinvest have significantly better performance than funds in which foundations decide not to reinvest. Funds that are reinvested by foundations have an average net IRR of .43 percent and funds that are not reinvested by foundations have an average net IRR of -1.13 percent. Other types of investors such as endowments and public pension funds except private pension funds, appear to have abilities to choose better performing funds, but the differences are not statistically significant. These results confirm that foundations have better ability to obtain soft information on incumbent managers.

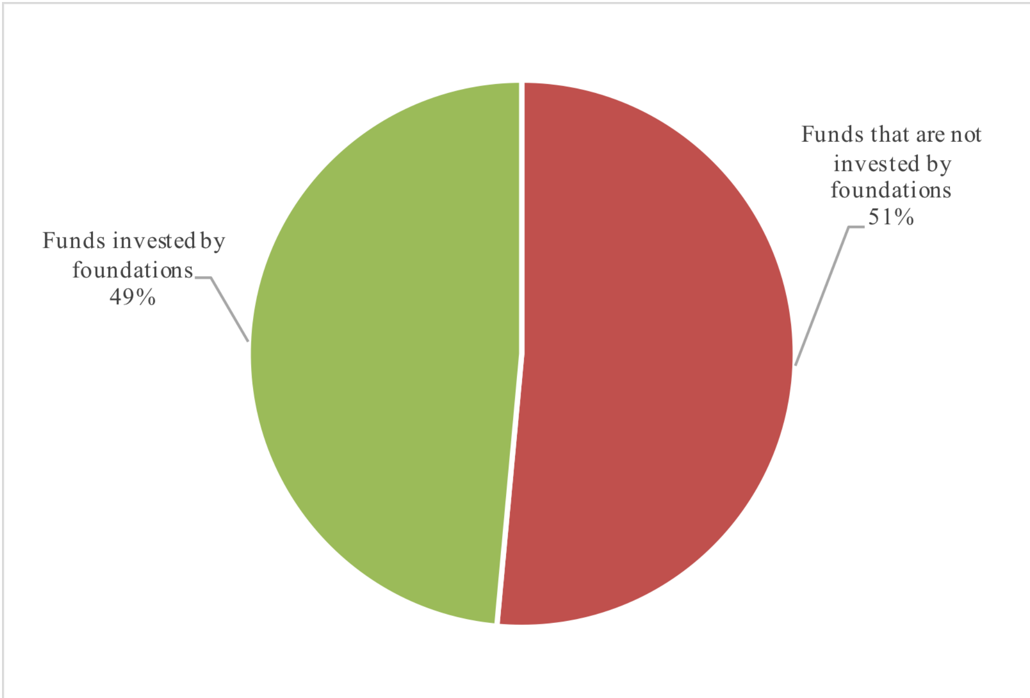

Figure 2.5. The figure shows the proportion of funds invested by foundations. Among 474 funds in the sample, foundations invest in 49% of funds.

Based on the findings that only foundations reveal the investment patterns that are consistent with those of sophisticated investors, I separate funds into two groups on the basis of whether the funds are invested by foundations or not, and briefly review the distribution of the two subsamples. Figure 2.5 shows that foundations invest in 49 percent of 344 funds in the sample. Thus, the sample is evenly divided into two subsamples of funds invested by sophisticated investors and funds invested by unsophisticated investors. Table 2.5 shows the cross-sectional means of size, change in size, and three different return measures which includes multiple X, net IRR, and excess net IRR adjusted to a benchmark index. The statistics are broken down into three categories: all funds, funds invested in by sophisticated investors, and funds invested by unsophisticated investors. There is a slight difference in the performance between the

Table 2.5

Mean Fund Characteristics (Funds Invested by Sophisticated Investors vs. Funds Invested by Unsophisticated Investors)

Variable	N	Mean	StdDev	Min	Max
Panel A: All Funds					
Size	344	520.51	792.52	5.00	10900.00
MultipleX	344	1.31	0.57	0.03	4.17
NetIRR	344	7.72	14.90	-53.50	75.00
Excess NetIRR	344	-0.78	13.03	-54.20	70.90
SizeGrowth	260	1.21	6.29	-0.81	99.00
Panel B: Funds Invested by Sophisticated Investors					
Size	167	833.79	1121.30	29.70	10900.00
MultipleX	167	1.27	0.50	0.13	2.72
NetIRR	167	6.36	12.48	-29.80	49.10
Excess NetIRR	167	-1.88	10.42	-39.50	45.00
SizeGrowth	110	0.72	0.82	-0.62	3.86
Panel C: Funds Invested by Unsophisticated Investors					
Size	177	403.52	398.02	13.00	3235.50
MultipleX	177	1.20	0.48	0.03	2.26
NetIRR	177	5.41	14.34	-53.50	43.70
Excess NetIRR	177	-2.22	12.68	-53.00	44.20
SizeGrowth	113	1.77	9.45	-0.81	99.00

Note: The table reports descriptive statistics for three different samples (All funds, funds invested by sophisticated investors, and funds invested by unsophisticated investors). Three performance measures (multiple X, net IRR, and excess net IRR to benchmark) are all final returns to investors.
Size growth is the percentage change in fund size from the past fund to the follow-on fund.

two subsamples. The funds invested in by sophisticated investors have an average net IRR of 6.36 percent, while the funds invested by unsophisticated investors have an average net IRR of 5.41 percent. Significant difference, however, can be found in the change in size. The funds invested in by sophisticated investors decrease their fund size in average by 38 percent compared to their prior funds. In contrast, the funds invested in by unsophisticated investors have an average growth rate of 77 percent. Taken together, the funds invested in by sophisticated investors grow much less and perform better than the funds that are not invested in by unsophisticated investors.

2.7. Results

Using regression analysis, I formally test whether sophisticated investors and unsophisticated investors affect the relation of fund size to past performance specified in Equation 1 and the performance persistence specified in Equation 2 in different ways.

2.7.1. Relation of Fund Size to Past Fund Performance

I first estimate the relation between fund size and past performance. Column 3 of Table 2.6 reports the estimates for full sample. The estimates are generally consistent with the findings of Tomperi (2010) that shows strong capital allocations into better performing funds in globally raised private equity real estate funds during 1990-2009. Fund size is positively and significantly related to lagged fund return but fund size is not significantly associated with sequence number. This weak relation between fund size and sequence number may be accounted for by the fact that private equity real estate funds are still in early stages of growth.

Column 6 and 9 of Table 2.6 report the results of the regression conducted separately for the funds invested in by sophisticated investors and unsophisticated investors respectively. Fund size is positively related to lagged return in both sub-samples, but the relation of fund size to lagged return is significant only for the sub-sample where unsophisticated investors participate. For the funds invested in by sophisticated investors, the coefficient of past return is almost zero, while lagged fund size and sequence number have positive effects on fund size. In contrast, for the funds invested in by unsophisticated investors, fund size is significantly related to lagged return as well as lagged fund size. Fund size increases 1.7 percent as lagged fund return increases

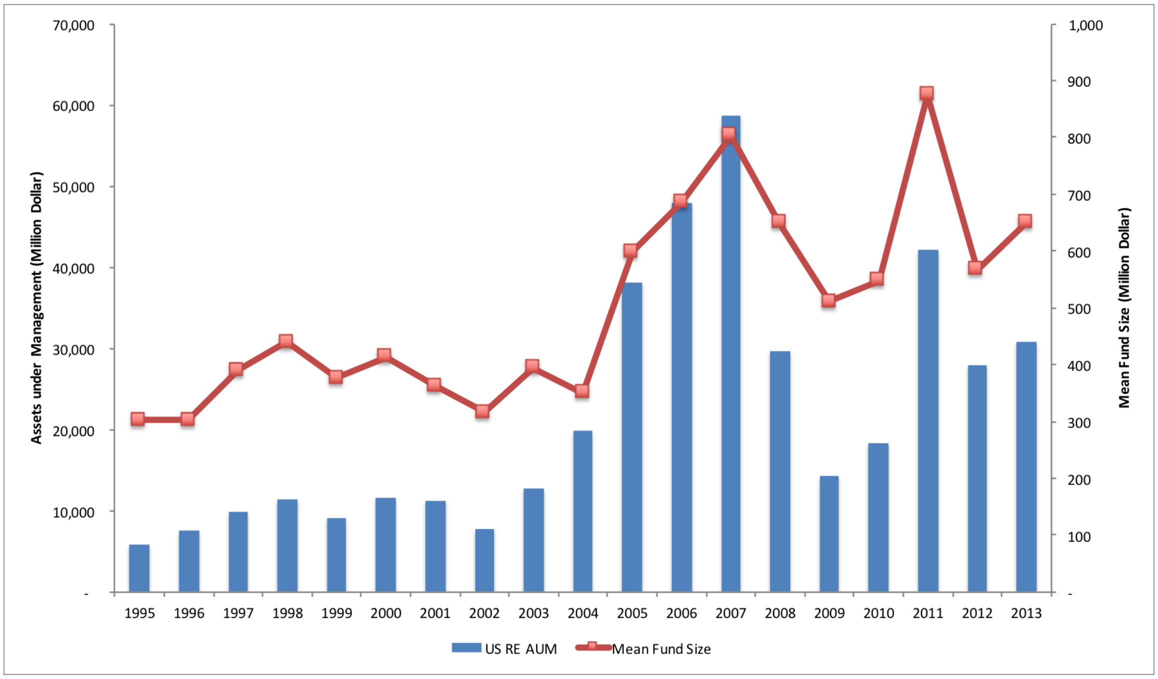

Figure 2.6. The figure shows the historical allocation of total capital and average fund size in the private equity real estate funds raised in US during 1995-2013.

1 percent. The results are consistent with the hypothesis that the growth of fund size is limited by sophisticated investors.

These findings stand in complete contrast to those of Phalippou (2010). The author argues that sophisticated investors contribute to increased fund size proportionally to past return. However, it should be noted that his classification of funds backed by sophisticated investors and funds backed by unsophisticated investors is not grounded in the actual data. The author simply generalizes that top-performing funds are the ones that are backed by sophisticated investors, and bottom-performing funds are the ones that are backed by unsophisticated investors.

To examine the robustness of the results, I perform additional regressions. First, I test whether the discrete relation of fund size to past performance between the two fund groups - one backed by sophisticated investors and the other backed by unsophisticated investors - still hold over different sample periods. I divide the sample into two sub-periods: 1995--2003 and 2004--2009. As Figure 2.6 shows, the vintage year of 2004 represents a break-point in that the allocation of capital in the private equity real estate funds jumped up and also the number of real estate funds significantly increased. Column 6 and 9 of Panel A and B in Table 2.7 show the consistent results across the two sub-periods that only the funds invested by unsophisticated investors have a highly significant positive relation between fund size and past performance.

In sum, the findings provide strong evidence that sophisticated investors and unsophisticated investors create two discrete forces on the growth of fund size. That is, unsophisticated investors contribute to increase fund size, but sophisticated investors suppress the growth of fund size.

2.7.2. Performance Persistence

The results of section 2.6.1. show that heterogeneous investors generate different relationships between fund flows and past performance. In this section, I test whether the heterogeneity in investor sophistication also creates variation in performance persistence.

I begin with regression on the full sample to find whether private equity real estate funds raised exclusively in US during 1995-2009 have similar performance persistence as shown in the previous studies that include all globally raised real estate funds during 1990-2009 (*e.g.,* Tomperi, 2010; Aarts & Baum, 2013). Column 3 of Table 2.8 show the results of regression of Net IRR on lagged Net IRR, controlling for size, sequence, vintage year fixed effects and a strategy dummy. The coefficient on lagged return is positive and significant. The estimated coefficient of 0.22 implies that a 1percent increase in the past return would be associated with about a 22 basis point increase in the follow-on fund return.

Table 2.6

Relation of Fund Size to Past Performance

	Dependent Variable: log(Size)								
	All Funds			Funds Invested by Sophisticated Investors			Funds Invested by Unsophisticated Investors		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged NetIRR	-0.013	0.011 ***	0.011 ***	-0.001	0.002	0.002	0.004	0.017 ***	0.017 ***
	(0.007)	(0.004)	(0.004)	(0.008)	(0.004)	(0.004)	(0.008)	(0.006)	(0.006)
log(Lagged Size)		0.83 ***	0.83 ***		0.77 ***	0.75 ***		0.63 ***	0.63 ***
		(0.03)	(0.03)		(0.05)	(0.05)		(0.08)	(0.08)
log(Fund Sequence)			0.032			0.18 *			-0.03
			(0.09)			(0.09)			(0.17)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.02	0.75	0.75	0.00	0.75	0.77	0.00	0.49	0.49
N of Observations	243	240	240	102	102	102	105	105	105

Note: The table reports regression results in which the dependent variable is fund size. The independent variables are lagged net IRR, the log of the prior fund size, and fund sequence (log of the sequence number of a fund). Lagged net IRR is the final returns to investors of the prior fund. Fund size is the committed capital to a fund. The regression includes strategy and quarter effects. Standard errors are clustered on both strategy and year. Robust t-statistics are reported in the parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

Table 2.7

Relation of Fund Size to Past Performance (1995-2003 vs. 2004-2009)

Panel A. Fund Size and Past Performance (1995-2003)

	Dependent Variable: log(Size)								
	All Funds			Funds Invested by Foundations			Funds Invested by Public Pension Funds		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged NetIRR	-0.038 ***	0.008	0.008	-0.011	-0.004	-0.004	-0.011	0.047 *	0.061 **
	(0.014)	(0.008)	(0.008)	(0.017)	(0.009)	(0.009)	(0.026)	(0.026)	(0.029)
log(Lagged Size)		0.84 ***	0.84 ***		0.70 ***	0.68 ***		0.63 ***	0.63 ***
		(0.05)	(0.05)		(0.08)	(0.08)		(0.16)	(0.15)
log(Fund Sequence)			0.00202			0.24			0.43
			(0.15)			(0.18)			(0.38)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.07	0.75	0.75	0.01	0.71	0.73	0.01	0.46	0.50
N of Observations	121	121	121	49	49	49	41	41	41

Panel B. Fund Size and Past Performance (2004-2009)

	Dependent Variable: log(Size)								
	All Funds			Funds Invested by Foundations			Funds Invested by Public Pension Funds		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged NetIRR	-0.002	0.012 ***	0.012 ***	0.001	0.004	0.004	0.006	0.016 ***	0.017 ***
	(0.008)	(0.004)	(0.004)	(0.009)	(0.004)	(0.004)	(0.008)	(0.006)	(0.006)
log(Lagged Size)		0.81 ***	0.79 ***		0.82 ***	0.80 ***		0.69 ***	0.71 ***
		(0.04)	(0.05)		(0.06)	(0.06)		(0.09)	(0.10)
log(Fund Sequence)			0.11			0.14			-0.16
			(0.12)			(0.10)			(0.19)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.00	0.74	0.74	0.00	0.81	0.81	0.01	0.51	0.52
N of Observations	135	135	135	57	57	57	68	68	68

Note: The table reports results of the same regression in Table 2.6 for two subsamples. In Panel A, the sample includes funds that are raised during 1995-2003. In Panel B, the sample includes funds that are raised during 2004-2009. *significant at 10%; **significant at 5%; ***significant at 1%.

Next, I examine whether performance persistence varies in the two subsamples. I hypothesize that funds invested in by sophisticated investors show strong performance persistence and funds invested in by unsophisticated investors have weak or no performance persistence. Column 6 of Table 2.8 presents estimates of a regression that is separately performed for the funds invested in by sophisticated investors. The coefficient of lagged return is positive and significant. The coefficient of 0.42 compares to that of 0.22 in the full sample suggesting that there is about as twice as strong performance persistence in the funds invested by sophisticated investors. In column 9, I test performance persistence with funds invested by unsophisticated investors. The point estimate on the lagged return is 0.06 and no longer significant. In sum, the results are consistent with the hypothesis that performance persistence exists only in the funds where sophisticated investors participate.

In prior studies, there is a puzzling question: Why is performance persistence mainly pronounced in the poorly performing funds? I run regressions separately for top-performing funds and bottom-performing funds in order to see whether I can replicate the same problem with the sample in this study. The two subsamples are divided by the median of net IRRs for each vintage year. Column 3 of Panel A in Table 2.9 shows regression estimates for top-performing funds. Consistent with the findings of Phalippou (2010), the coefficient of lagged return is 0.08 with no significance. In contrast, in column 3 of Panel B that shows estimates for bottom-performing funds, the coefficient of lagged return is positive (0.17) and significant.

In column 6 and 9 of Panel A, I estimate the persistence regressions for top-performing funds after accounting for the presence of sophisticated and unsophisticated investors. Column 6 of Panel A presents estimates for top-performing funds invested by sophisticated investors, while column 9 of Panel A shows estimates for top-performing funds invested by unsophisticated investors. The coefficient of lagged return for top-performing funds is positive (0.43) and significant when sophisticated investors participate in their funds, but the coefficient is not significant when unsophisticated investors invest in their funds. Column 6 of Panel B presents estimates for bottom-performing funds invested by sophisticated investors, while column 9 of Panel B shows estimates for bottom-performing funds invested by unsophisticated investors. The coefficient of lagged return for top-performing funds is positive (0.43) and significant when

Table 2.8

Performance Persistence

	Dependent Variable: Net IRR								
	All Funds			Funds Invested by Sophisticated Investors			Funds Invested by Unsophisticated Investors		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged NetIRR	0.24 ***	0.21 ***	0.22 ***	0.42 ***	0.42 ***	0.42 ***	0.07	0.07	0.06
	(0.07)	(0.07)	(0.07)	(0.13)	(0.13)	(0.13)	(0.10)	(0.11)	(0.11)
log(Size)		-1.64 **	-1.70 **		-0.36	-0.44		-0.66	-0.59
		(0.66)	(0.68)		(1.66)	(1.76)		(1.65)	(1.67)
log(Fund Sequence)			0.80			0.40			-1.00
			(1.74)			(2.77)			(3.12)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.06	0.09	0.09	0.13	0.13	0.13	0.01	0.01	0.01
N of Observations	230	229	229	96	96	96	100	99	99

Note: The table reports regression results in which the dependent variable is fund size. The independent variables are lagged net IRR, the log of the prior fund size, and fund sequence (log of the sequence number of a fund). Lagged net IRR is the final returns to investors of the prior fund. Fund size is the committed capital to a fund. The regression includes strategy and quarter effects. Standard errors are clustered on both strategy and year. Robust t-statistics are reported in the parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

Table 2.9

Performance Persistence (Top-performing Funds vs. Bottom-performing Funds)

Panel A. Performance Persistence (Top Performing Funds)

	Dependent Variable: Net IRR								
	All Funds			Funds Invested by Sophisticated Investors			Funds Invested by Unsophisticated Investors		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged NetIRR	0.08	0.08	0.08	0.40 **	0.38 *	0.43 **	-0.04	-0.03	-0.02
	(0.07)	(0.08)	(0.08)	(0.19)	(0.19)	(0.20)	(0.10)	(0.10)	(0.11)
log(Lagged Size)		0.07	0.09		1.07	1.31		1.30	1.27
		(0.68)	(0.69)		(1.62)	(1.61)		(1.82)	(1.85)
log(Fund Sequence)			-0.504			-4.57			1.53
			(2.04)			(3.76)			(3.13)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.01	0.01	0.01	0.17	0.19	0.25	0.01	0.02	0.03
N of Observations	121	121	121	43	43	43	53	53	53

Panel B. Performance Persistence (Bottom Performing Funds)

	Dependent Variable: Net IRR								
	All Funds			Funds Invested by Sophisticated Investors			Funds Invested by Unsophisticated Investors		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged NetIRR	0.17 **	0.17 **	0.17 ***	0.12	0.12	0.18	0.14	0.13	0.13
	(0.07)	(0.07)	(0.06)	(0.12)	(0.13)	(0.12)	(0.16)	(0.19)	(0.18)
log(Lagged Size)		0.09	-0.13		-0.77	-2.87		0.14	0.44
		(0.84)	(0.82)		(1.92)	(2.01)		(2.40)	(2.33)
log(Fund Sequence)			1.79			5.93 **			-7.33
			(1.90)			(2.55)			(5.12)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.07	0.06	0.07	0.03	0.03	0.18	0.04	0.04	0.15
N of Observations	109	108	108	53	53	53	47	46	46

Note: The table reports results of the same regression in Table 2.8 for two subsamples. In Panel A, the sample includes top-performing funds (with performance above median). In Panel B, the sample includes bottom-performing funds (with performance below median). *significant at 10%; **significant at 5%; ***significant at 1%.

sophisticated investors participate in their funds, but the coefficient is not significant when unsophisticated investors invest in their funds.

Overall, the results indicate that performance persistence is statistically strong only in the top-performing funds invested in by sophisticated investors. Once the heterogeneity of investors is accounted for in the regression, the puzzle of persistence in the bottom performers no longer exists. This result is intriguing because the findings are not only consistent with the argument of

Kaplan and Schoar (2005) that the persistence exists in the top-performing funds, but also provides a new insight that among the top-performing funds the persistence is confined to the top-performers invested in by sophisticated investors who can suppress the growth of fund size. To assess the robustness of the results, I tackle additional issues raised in the previous studies. First, Phalippou (2010) criticizes that the performance persistence is driven by the overlapping investment periods by two successive funds. They argue that when the vintage years are close enough, the fund returns correlate because the funds share common market conditions. Thus, I exclude the successive funds raised with only one year gap from their prior funds. The results in Table 2.10 confirm that the performance persistence is not brought by the overlapping investments. The performance persistence clearly appears only in the funds invested in by sophisticated investors. Second, several studies suggest that investment persistence vary over time because some investors lose the comparative advantage to have early access to good funds over time. I divide the sample into the two periods, before and after 2004 and run regressions to test any variations in the base results. Table 2.11 presents consistent results that persistence exists only in the funds invested by sophisticated investors.

Table 2.10

Performance Persistence (More Than 2 Year Gap Between Two Successive Funds)

	Dependent Variable: Net IRR								
	All Funds			Funds Invested by Sophisticated Investors			Funds Invested by Unsophisticated Investors		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged NetIRR	0.27 **	0.25 **	0.26 **	0.405 *	0.41 *	0.40 *	0.09	0.11	0.12
	(0.11)	(0.11)	(0.12)	-0.207	(0.21)	(0.21)	(0.16)	(0.16)	(0.17)
log(Lagged Size)		-2.11 ***	-2.25 ***		-0.78	-0.70		-3.22 **	-3.34 *
		(0.73)	(0.81)		(1.68)	(1.77)		(1.56)	(1.79)
log(Fund Sequence)			1.20			-0.52			1.40
			(2.35)			(2.71)			(4.01)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.07	0.10	0.10	0.14	0.14	0.14	0.01	0.05	0.05
N of Observations	166	165	165	75	75	75	76	75	75

Note: The table reports results of the same regression in Table 2.8 for the sample that excludes funds that are raised less than two years from prior fund. *significant at 10%; **significant at 5%; ***significant at 1%.

Table 2.11

Performance Persistence (1995-2003 vs. 2004-2009)

Panel A. Performance Persistence (1995-2003)

	Dependent Variable: Net IRR								
	All Funds			Funds Invested by Sophisticated Investors			Funds Invested by Unsophisticated Investors		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged NetIRR	0.41 **	0.34 **	0.33 **	0.75 **	0.76 **	0.76 **	0.38	0.37	0.15
	(0.14)	(0.16)	(0.15)	(0.32)	(0.33)	(0.33)	(0.25)	(0.28)	(0.31)
log(Lagged Size)		-1.86 **	-1.86 **		1.20	1.80		-2.91	-2.43
		(0.67)	(0.68)		(3.36)	(3.51)		(2.42)	(2.39)
log(Fund Sequence)			-1.534			-4.43			-7.25
			(2.16)			(6.49)			(5.09)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.10	0.13	0.13	0.15	0.16	0.17	0.09	0.14	0.22
N of Observations	118	118	118	47	47	47	42	42	42

Panel B. Performance Persistence (2004-2009)

	Dependent Variable: Net IRR								
	All Funds			Funds Invested by Sophisticated Investors			Funds Invested by Unsophisticated Investors		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lagged NetIRR	0.23 **	0.23 **	0.23 **	0.48 **	0.48 **	0.49 **	0.04	0.04	0.04
	(0.08)	(0.08)	(0.09)	(0.20)	(0.19)	(0.20)	(0.11)	(0.12)	(0.12)
log(Lagged Size)		-1.41	-1.57		-1.32	-1.87		0.35	0.30
		(0.95)	(1.07)		(1.26)	(1.36)		(2.05)	(2.16)
log(Fund Sequence)			1.15			2.39			0.91
			(2.27)			(1.38)			(3.37)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategy F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.07	0.08	0.09	0.27	0.28	0.29	0.00	0.00	0.00
N of Observations	125	125	125	53	53	53	63	63	63

Note: The table reports results of the same regression in Table 8 for two subsamples. In Panel A, the sample includes funds that are raised during 1995-2003. In Panel B, the sample includes funds that are raised during 2004-2009. *significant at 10%; **significant at 5%; ***significant at 1%.

2.8. Summary

This chapter explores the impact of heterogeneous investors on the fund size and performance of private equity real estate funds. Previous studies are limited to capture different, though not incompatible, fund behaviors because they emphasize only the role of sophisticated investors without recognizing the presence of unsophisticated investors. To offset this limitation, this study takes into account the fact that institutional investors are heterogeneous in the level of investor sophistication. Among various institutional investors who participate in the private equity real estate funds raised in US during 1995-2009, I find that foundations are the most sophisticated investors, and the other types of investors do not show any distinct skills or abilities in making their reinvestment decisions.

Using a novel Preqin's investor data set that shows which type of investors participate in individual real estate funds, this study documents the influence that sophisticated investors and unsophisticated investors exert on fund dynamics. I find that the funds invested in by sophisticated investors have a weak fund size-performance relation and show strong performance persistence, while the funds invested in by unsophisticated investors have a strong fund size-performance relation and no performance persistence. The results provide strong evidence that the size growth and performance persistence in private equity real estate funds hinges on which type of investors participate in those funds.

3. CHAPTER THREE

THE IMPACT OF TIME-VARYING FINANCING CONDITIONS ON LIQUIDITY MANAGEMENT OF REITS

3.1. Introduction

The purpose of this chapter is to investigate the impact of time-varying financing conditions on liquidity management of REITs. In particular, I examine how financially constrained REITs that face investment opportunities respond to the time-varying financing conditions by changing policies on seasoned equity issuances and credit lines. Academic interests in time-varying financing conditions have been increased after the recent financial crises to figure out how financing constraints alter firms' investment plans and liquidity policies. In the liquidity management literature, a large set of studies have primarily examined cash saving behaviors of non-REIT firms as a distinct response to financial frictions (*e.g.*, Bate *et al.,* 2006; Almedia, Campello, and Weisbach, 2004; Mclean, 2011). They propose that firms are likely to stockpile cash as a precautionary measure to support their future investment opportunities in front of deteriorating financing conditions. However, cash savings from operation or external financing is not a feasible alternative for REITs to manage liquidity in general because REITs have to distribute at least 90 percent of their taxable income to their shareholders and retain very limited cash savings to maintain a special tax-exempt status[2].

Given the REITs' limitation of saving cash, recent empirical work examines how REITs utilize credit lines as an alternative liquidity source to cash savings (*e.g.*, Hardin III and Hill, 2009; An, Hardin III, and Wu, 2010; Ooi, Wong, and Ong, 2012). Their major interests are to

[2] I perform a regression analysis to test whether cash savings from equity issuance is persistent. The results show that cash savings from equity offerings last less than three quarters. See Appendix 1 for details.

find whether firms can utilize credit lines when access to external finance is limited. Since these studies share the same intuition that credit lines allow firms to postpone raising external funds until financing conditions become favorable, the role of equity offerings in providing liquidity under unfavorable financing conditions has not been examined. It has been commonly accepted that REITs extensively utilize credit lines during tight financing conditions to finance investments and pay back the credit line drawdowns when financing conditions become favorable (*e.g.*, Brown and Riddiough, 2003; Riddiough and Wu, 2009).

However, the empirical tests for the so-called bridge loan hypothesis have a serious issue. There is no control for the time-varying financing conditions. Thus, it is hard to tell when equity or debt offerings are used to repay the drawdowns of credit lines. There is no concrete evidence that the repayments occur during periods of favorable financing conditions. In addition, the interpretation of negative sensitivity of credit lines to equity offerings by Riddiough and Wu (2009) is questionable. They explain that credit lines and equity offerings have negative relation because REITs reduce their access to credit lines while the proceeds of equities offerings are available. It is quite surprising that they do not highlight the role of equity offerings in repaying the drawdowns of credit lines. Even a simple analysis reported in Table 3.1 reveals 93 percent of seasoned equity issuances in the sample are associated with reduction in credit line drawdowns. The exclusive use of equity offerings for investments makes up only 8 percent of total equity offerings.

This study challenges the notion that REITs are able to draw down a sizable amount of credit lines for investments in advance when they are uncertain of securing external funds. Instead, I suggest that during tight financing conditions, financially constrained REITs start material investments by raising seasoned equities and aggressively pay down credit lines at the

Table 3.1

Motives of Seasoned Equity Offerings

	Full Sample		Constrained		Unconstrained	
	N	Percent	N	Percent	N	Percent
Investment Only	271	0.37	136	0.36	135	0.3
Credit Line Repayment Only	62	0.08	25	0.07	37	0.1
Investment and Credit Line Repayment	397	0.54	216	0.57	181	0.5

Note: The table reports the motives of seasoned equity offerings. Depending on the changes in investment and credit line drawdown, each equity offering is classified into three categories: 1) investment only, 2) credit line repayment only, 3) both investment and credit line repayment. For example, if seasoned equity offering is accompanied by contemporary increase in investment but no decrease in credit line drawdowns, the equity offering is classified into "investment only". If there is decrease in credit line drawdowns but no increase in investment, the equity offering is placed to "credit line repayment only". The final category of "investment and credit line repayment" is applied to the equity offering with contemporary increase in investment and decrease in credit line drawdowns. The results are listed for full sample and subsamples of constrained and unconstrained groups respectively.

same time with the proceeds of their limited equity offerings to maintain a high level of funding capacity in anticipation of consecutive investments. As far as I am aware, no other studies have explored the impact of stochastic financing conditions on liquidity policies of REITs. By investigating how REITs mitigate the impact of reduced external financing on investments by adjusting policies on equity issuances and credit lines, I unveil unique liquidity management behaviors of REITs.

Before delving into finding the impact of financing conditions on liquidity management, I first identify the REITs whose investments are highly vulnerable to the time-varying financing conditions since this study is interested in finding how REITs are able to finance investments when their financing conditions are not favorable. McLean and Zhao (2014) provide evidence that financially dependent firms that are small and have no credit rating are more likely to decrease their investments compared to less financially dependent firms during recessions and periods of low investor sentiment due to the higher reduction in equity financing rather than in debt financing. Drawing on their argument, I investigate whether the time-varying financing conditions mainly affect the investing and financing activities of constrained REITs, leaving unconstrained REITs relatively less affected. The results show that the time-varying financing conditions have a greater impact on the investments and external financing of constrained REITs than those of unconstrained REITs.

Next, I examine which funding sources become more valuable to financially constrained REITs. By doing so, I seek to confirm whether constrained REITs resort to equity offerings and credit lines in order to fund investments under increasing financing costs. In previous research, there is strong evidence that credit lines play an important role in reducing the negative impact of financial shocks on firms' investment activities. Campello, Giambona, Graham, and Harvey (2011) find credit lines are associated with higher investments during the 2008-2009 financial crisis. Ooi, Wong, and Ong (2012) present evidence that the utilization of credit lines rise during credit crunch. However, prior studies fail to examine whether credit lines can be utilized independently without being supported by external finance under deteriorating financing conditions. My findings suggest that deteriorating financing conditions lead financially constrained REITs to increase their reliance on the proceeds of seasoned equity offerings as well as the drawdowns of credit lines to finance their investments.

Given the increased reliance on both equity offerings and credit lines, this study raises the possibility that credit lines are not an independent funding source for investments. I propose that financially constrained REITs save cash from seasoned equity offerings into committed credit by repaying the drawdowns of credit lines. The analysis exhibits that the financially constrained

REITs that face increasing financing costs are more likely to save new credit from seasoned equity offerings as unused credit lines.

The final analysis is to find whether the time-varying financing conditions affect the other dimension of the interplay between seasoned equity offerings and credit lines, the order of accessing the two funding sources. I hypothesize that sizable drawdowns of credit lines are followed by seasoned equity offerings under falling financing conditions. This is quite contrary to the traditional bridge loan hypothesis which suggests that REITs prefer to utilize credit lines first in the recession and pay off the drawdown of credit lines later during favorable credit market conditions. The results show that equity offerings lead to positive credit line drawdowns up to three quarters after the offerings when constrained REITs are under high financing costs, while the effects of equity offerings on the credit line drawdowns last only one quarter after the issuance under low financing costs.

Taken together, the findings provide strong evidence that the time-varying financing conditions create distinct variation in how credit lines interact with equity offerings, especially when REITs are financially constrained.

3.2. Literature Review

This chapter aims to extend the REIT liquidity management literature by adding missing solution to two puzzles. The first puzzle is the time varying financing conditions. In the recent non-REIT literature, Bolton, Chen, and Wang (2013) propose a theoretical model to explain firms' behavior of equity market timing and cash saving in response to stochastic financing conditions. Their theoretical model predicts that financially constrained firms save cash for future investment opportunities during good financing conditions in order to limit the negative effects of liquidity problem on investments during the recession. Several empirical studies also support their argument by finding non-REIT firms save cash for a precautionary measure from internal cash flows or equity issuances. Almeida, Campello, and Weisbach (2004) show that the level of credit constraints determines the sensitivity of cash savings to internal cash flows. Financially constrained firms have a higher propensity to save cash from operation compared to unconstrained firms. On the other hand, McLean (2011) finds that precautionary motives increase the propensity to save the cash from equity issuance.

In the REIT literature, there have been no studies that include time-varying financing conditions to explain potential variation in REIT's liquidity management policies. In fact, cash saving is not a viable option for REITs because REITs are not allowed to save sizable cash from operation and are also not encouraged to carry large cash savings from equity offerings given the negative responses of investors and lenders, who are afraid of agency problems caused by excessive cash in manager's hands. Thus, this study explores whether changing financing conditions create variance in credit line policies rather than cash holding policies.

The second unsolved puzzle is the interplay between equity issuance and credit lines. For firms under capital market frictions, three options are given to mange their corporate liquidity: a) equity issuance, b) cash savings from operation, and c) credit lines (Asvanunt, Broadie, and Sundaresan, 2010). However, the relation of credit lines and equity issuances have not been comprehensively examined, even though those two funding sources provide REITs with ample liquidity while cash savings from operations is insufficient to fund investment activities. Only a few studies recognize the limitation of saving cash and include credit lines as a component of REITs' liquidity and capital structure. Hardin and Hill (2009) and An, Hardin, and Wu (2010) study how the availability and use of credit lines are determined by firm characteristics or level of information asymmetry in REITs. Ooi, Wong, and Ong (2012) find that credit lines help

REITs to mitigate refinancing risks under credit constraints by narrowing down the role of credit lines specifically under the recent financial crisis in 2008. These studies mostly focus on utilizing credit lines as an alternative funding source for investments and do not explore how credit lines are paid back with other external funding sources. In an effort to understand the interaction between credit lines and external finance, Riddiough and Wu (2009) find a negative relation between credit lines and equity issuance, but they argue that the negative relation reflects the fact that credit line is less utilized for investments when REITs issue equities, rather than credit lines are directly paid down by equity issuances. Thus, this study fills the gap in the literature by documenting how much the proceeds of equity issuances are reserved as unused credit lines in the presence of increasing financing costs and whether the changing financing conditions affect the order of accessing equity offerings and credit lines.

This chapter is related to the previous study on how time-varying financing conditions affect investments. McLean and Zhao (2014) provides important evidence that financing conditions have greater impact on investments of financially dependent firms than less dependent firms because tighter financing conditions reduce equity issuances more than debt issuances. They mainly focus on the investment activities, but this study investigates the impact of time-varying financing conditions on liquidity management. This research is also similar to the studies of Almeida, Campello, and Weisbach (2004) and McLean (2011) in that the sensitivity or propensity of saving liquidity is measured depending on the credit constraints or precautionary needs. However, my work is differentiated from the previous researches in several ways. First, my research is centered on the cross-sectional variation of sensitivity to reserve credit lines, while McLean (2011) focuses on the inter-temporal changes of propensity to save cash from equity issuances. Second, I am more interested in finding how REITs' liquidity is managed for their investment needs rather than operation needs.

3.3. Data and Sample Construction

7,460 REITs firm-quarter observations from 2000:1 to 2015:2 are pulled from SNL's REIT database. The SNL database provides detailed financial information about total assets, leverage, market-book ratio, cash savings, investments, and the total size and drawdowns of credit lines in each quarter. The initial set of observations is screened with following criteria. First, only public equity REITs listed in NYSE, AMEX or NASDAQ are included in the sample. Non-equity REITs such as mortgage and hybrid REITs are excluded. Second, the total assets of a REIT in the sample must be larger than $50 million. Third, the observations that are not under REIT tax status are excluded and also the observations within 1 year from IPO are excluded. Fourth, the REIT that have less than 12 observations are removed from the sample.

The NAREIT Capital Offering database provides information about capital offerings of each REIT such as common and preferred equity issuance proceeds, and public debt proceeds. There are 753 seasoned common equity offerings, 295 preferred equity offerings, and 562 public debt offerings in the sample. I separate the preferred equity issuance from the common equity issuance given the fact that REITs issues preferred equities as a substitute for public debt as proposed by Boudry, Kallberg, and Liu (2010).

There are two main challenges in the data preparation. The primary challenge is to create a reliable proxy to reflect financing conditions. I build two proxy variables to capture equity and debt financing conditions respectively and then derive a composite index, which is the first principal component of the two proxy variables. Another challenge comes from the fact that financing conditions may have differential impact on the liquidity policies according to the level of financial constraints. Thus, I use multiple measures such as S&P credit rating, market capitalization, and debt coverage ratio to ensure the robustness of classifying financially constrained and unconstrained groups. The detailed explanation for constructing proxy variables follows.

3.3.1. Measures of Time-varying Financing Conditions

I construct three proxy variables for each quarter to capture time-series fluctuations in financing conditions. To capture both equity financing and debt financing conditions, I create two separate time-series proxy variables for equity and debt financing conditions and then derive a composite index, which is the first principal component of the two variables. In the literature, there are a few ways to create a proxy variable for time-varying financing conditions. Altinkilic and Hansen (2000) use the direct costs such as underwriting fees, but Belo, Lin, and Yang (2014) point out that the variation in fees is too small to capture the unobserved indirect financing costs. Alternatively, Belo, Lin, and Yang (2014) use the fraction of firms that issue equity each year as a proxy for equity issuance costs, but their approach is limited to apply to REIT firms because the sample size of REITs is extremely small compared to that of non-REIT firms. There are only around 100 firms in each quarter and thus a small increase in the number of equity issuing firms can distort the movement of proxy variable. In addition, the fraction of equity issuing firms may reflect the required needs for equity financing, not the accessibility to equity financing. As seen during the recent financial shock, REITs have to raise more equities mainly because of the CMBS market shut down in 2007.

Thus, as a proxy for equity financing conditions, I create time series of the institutional demand variable based on the changes in institutional holdings. The idea behind using institutional investors' demand as a proxy for equity financing is that more than 78 percent of

REITs stocks in the sample are owned by institutional investors and thus the equity financing costs heavily depend on how much institutions are willing to absorb the new equity issuances. Equity financing condition variable is constructed as follows:

$$Equity\ Financing\ Condition_t = \frac{\sum_{i=1}^{n}(INSINC_{it}\text{-}INSDEC_{it})}{\sum_{i=1}^{n} INSTOT_{it}} \tag{1}$$

$INSINC_{it}$: $The\ number\ of\ institutions\ that\ initiate\ or\ increase\ a\ holding\ in\ firm\ i\ in\ quarter\ t$

$INSDEC_{it}$: $The\ number\ of\ institutions\ that\ decrease\ or\ terminate\ a\ holding\ in\ firm\ i\ in\ quarter\ t$

$INSTOT_t$: $The\ total\ number\ of\ institutions\ in\ firm\ i\ in\ quarter\ t$

Note that I use the number of institutions instead of the number of stocks that are purchased or sold by institutions. Alti and Sulaeman (2012) point out that these count-based variables reflect the institutional demand better than the aggregate number of stocks. The final equity financing condition proxy variable is smoothed using two-sided three quarter moving averages to reduce short-term volatility.

$$Moving\ Averaged\ Equity\ Financing\ Condition_t = \frac{1}{2k+1}\sum_{j=\text{-}k}^{k} Equity\ Financing\ Condition_{t+k} \tag{2}$$

As a proxy for debt financing conditions, I use the quarterly change in REIT liabilities. The FRED economic database provides a series of not seasonally adjusted quarterly liabilities that is the sum of commercial bank loans and debt securities in the REIT industry. The quarterly time-series of REIT debts is normalized by quarterly GDP.

$$Debt\ Financing\ Condition_t = \frac{(Total\ Bank\ Loans_{it}\text{-}Total\ Bank\ Loans_{it\text{-}1})}{GDP_{it}} \tag{3}$$

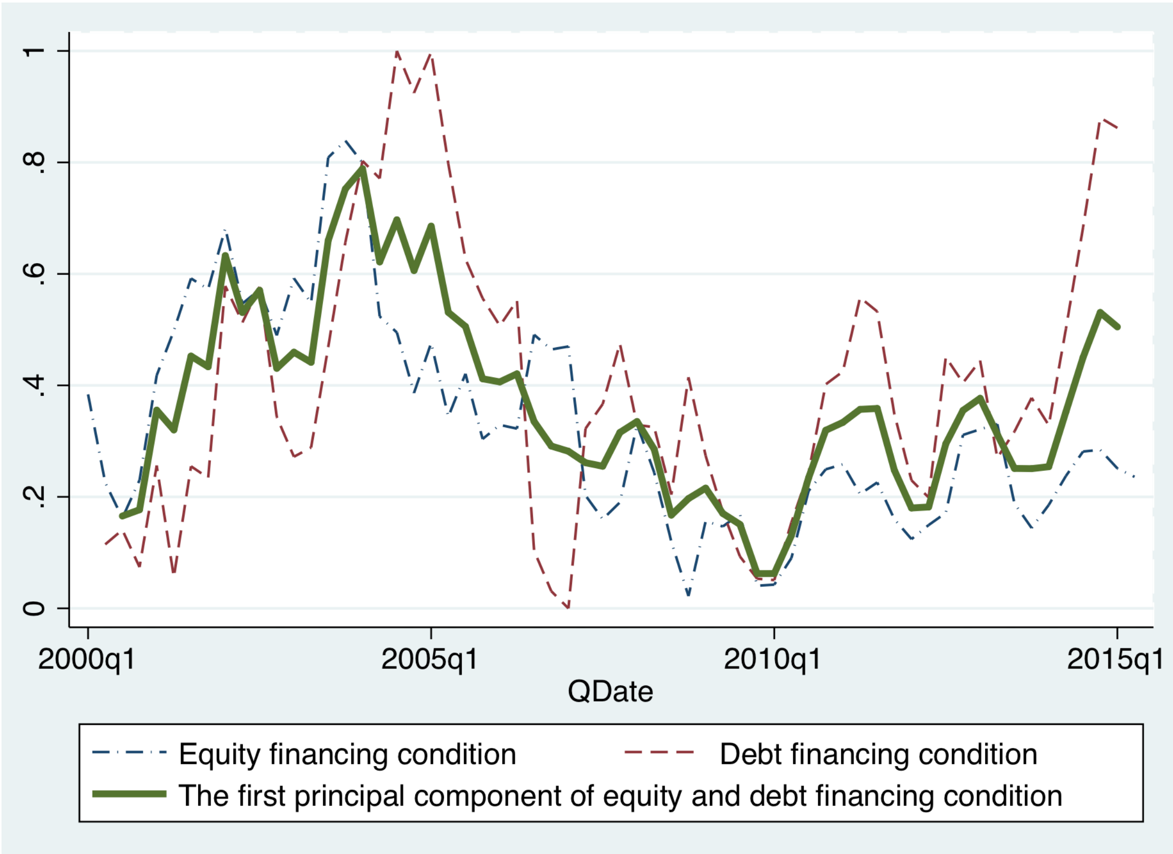

Figure 3.1. The figure shows quarterly trends of a proxy variable for equity financing condition (one dot), a proxy variable for debt financing (short dash), and the first principal component of the former two variables (solid line).

Figure 3.1 shows the time-trend of three proxy variables. Three proxy variables are normalized to make it easier to compare with each other. The two proxy variables for equity and debt financing conditions slightly have a lead-lag relationship suggesting that the two financing conditions are strongly but not perfectly correlated. It would be ideal to incorporate the equity and debt proxy variables together into the analyses, but instead I use a composite index that is the principal component of the two proxy variables to keep the empirical model parsimonious and tractable. The composite index is used for the reported results in the following analyses, but the other two proxy variables are also used to perform robustness checks in the unreported analyses.

3.3.2. Measures of Financial Constraints

The time-varying financing conditions must have differential impacts on the REITs' liquidity management depending on their constraints to access external finance. For example, financially constrained REITs that are small and have no credit ratings are prone to higher fluctuation of financing costs as financing conditions vary. In addition, the variation in liquidity policies using seasoned equities should be reflected more clearly in the constrained REITs because the constrained REITs rely more on seasoned equities to finance investments than unconstrained REITs. McLean and Zhao (2014) provide evidence that financially dependent firms cut their investments more drastically than financially less dependent firms because time-varying financing conditions affect the equity issuance more than debt issuance. Thus, this study examines the effects of financing conditions on liquidity management in the two separate groups: 1) financially constrained and 2) financially unconstrained REITs.

To ensure the robustness of measures to divide the sample into financially constrained and unconstrained REITs, I adopt multiple criteria such as S&P credit rating, market capitalization, and debt coverage ratio that may limit a REIT's access to external finance. In the literature, firm size, credit rating, and dividend payout ratio are most commonly used to measure the financial constraints, but I replace the dividend payout ratio with a debt coverage ratio because it is not clear to determine whether high dividend paying REITs or low dividend paying REITs are financially constrained[3].

[3] Riddiough and Wu (2009) use K-Z index to measure the financial constraints for REITs, but K-Z index is failed to prove that it is a reliable measure to reflect the REITs' financial constraints in my unreported analysis. Hennessy and Whited (2007) argue that K-Z index is to gauge a firm's need for external financing, not the firm's cost of external financing. I suspect that the dividend payout factor included in calculating K-Z index causes some bias.

To divide the full sample into two subsamples based on their financial constraints, I construct three dummy variables based on credit rating, firm size, and debt coverage ratio and then two composite variables that combine the first three variable statuses. The first rating dummy variable equals to one if the REIT is not rated by S&P in the previous quarter. The second firm size dummy variable equals to one if the size of REIT is below the 50th percentile among all REITs in each quarter. The third debt coverage ratio dummy variable equals to one if the debt coverage ratio is below the 50th percentile in each quarter. The fourth composite variable is a firm-quarter dummy variable that equals one if the sum of credit rating, firm size, debt coverage ratio dummies is greater than or equal to two. The fifth composite variable is a firm-quarter dummy variable that equals one if the sum of credit rating, firm size, debt coverage ratio dummies is greater than or equal to three.

Campello and Chen (2010) warn against drawing any inferences based on a single constraint measure by showing imperfect correlation among multiple measures of financial constraints. Table 3.2 confirms that the correlation between constraint measures is strong but not complete. The correlation between size and credit rating measures is very strong, but the correlation of interest coverage ratio to either size and credit rating is relatively weak. The composite indicator (1) captures the classification of three different constraint measures more consistently compared to the composite indicator (2).

Table 3.2

Correlation between constraint measures

		Rating		Market Cap.		Int. Coverage Ratio		Composite 1		Composite 2	
		U	C	U	C	U	C	U	C	U	C
Rating	Unconstrained	3,665									
	Constrained		3,795								
Market Cap.	Unconstrained	2,905	760	3,726							
	Constrained	821	2,974		3,734						
Int. Coverage Ratio	Unconstrained	2,133	1,532	2,254	1,472	3,821					
	Constrained	1,688	2,107	1,567	2,167		3,639				
Composite 1	Unconstrained	3,237	428	3,358	332	2,586	1,104	3,690			
	Constrained	453	3,342	368	3,402	1,235	2,535		3,770		
Composite 2	Unconstrained	3,665	2,056	3,726	1,995	3,821	1,900	3,690	2,031	5,721	
	Constrained		1,739		1,739		1,739		1,739		1,739

Note: The table reports correlation between constraint measures. There are three main constraint indicators: 1) S&P credit rating, 2) market capitalization, 3) Interest coverage ratio, 4) Composite 1, 5) Composite 2. The first rating dummy variable equals to one if the REIT is not rated by S&P in the previous quarter. The second firm size dummy variable equals to one if the size of REIT is below the 50th percentile among all REITs in each quarter. The third debt coverage ratio dummy variable equals to one if the debt coverage ratio is below the 50th percentile in each quarter. The composite 1 variable is a firm-quarter dummy variable that equals one if the sum of credit rating, firm size, debt coverage ratio dummies is greater than or equal to two. The composite 2 variable is a firm-quarter dummy variable that equals one if the sum of credit rating, firm size, debt coverage ratio dummies is greater than or equal to three. For instance, when a REIT has S&P credit rating, the REIT is classified into an unconstrained group. In case of market capitalization and interest coverage ratio, I divide the full sample into two subsamples based on the median value of each measure. If the market capitalization of a REIT is larger than the median of the full sample, the REIT is classified into an unconstrained group. If the interest coverage ratio of a REIT is larger than the median of full sample, the REIT is categorized into an unconstrained group.

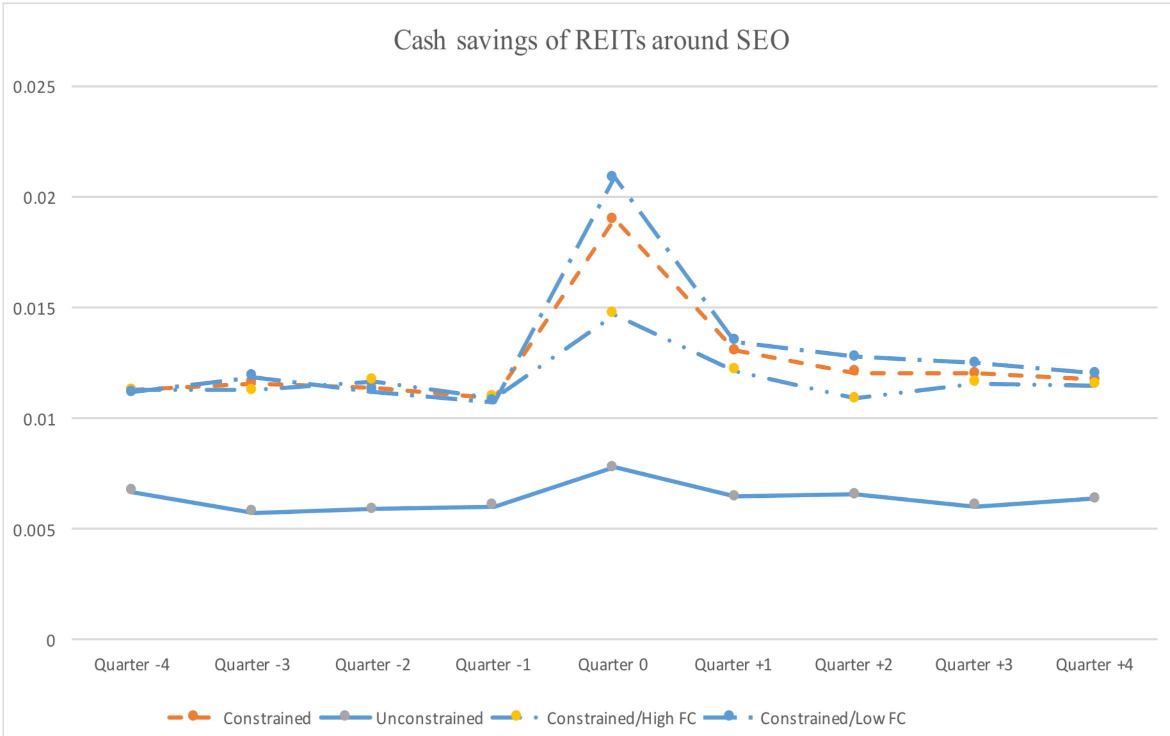

Figure 3.2. The figure shows the cash saving activities around a seasoned equity offering. To avoid confounding effect, any equity offerings that occur less than three quarters before or after other equity offerings are excluded. The solid line shows the cash saving of the unconstrained REITs and the dashed line represents the cash saving of the constrained REITs. The cash saving of the constrained REITs are drawn separately in two additional lines depending on financing conditions. The one-dotted line is the cash saving of constrained REITs under high financing conditions and the two-dotted line is the cash saving of constrained REITs under low financing conditions.

3.4. Results

3.4.1. Investment and Liquidity Management around Seasoned Equity Offerings

Before conducting regression analyses, I describe the dynamics of investment and liquidity management around seasoned equity offering by plotting simple median series of investments, credit line drawdowns, and cash savings from quarter -4 to +4 relative to the equity offering

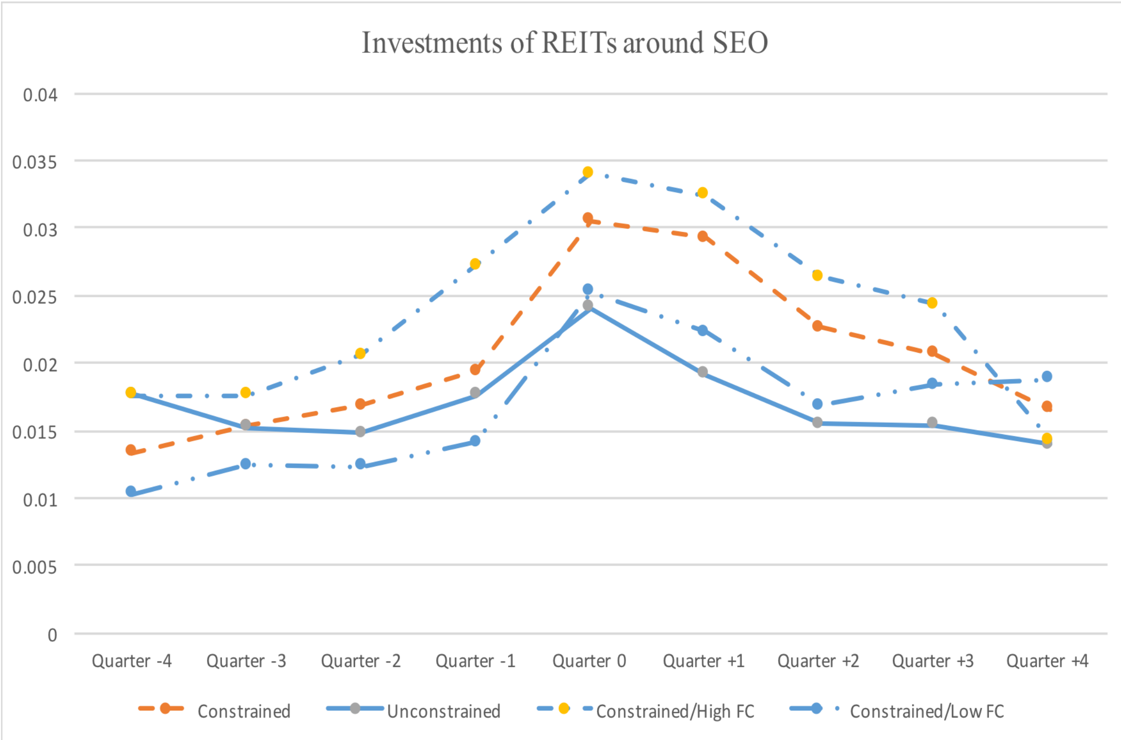

Figure 3.3. The figure shows the investment activities around a seasoned equity offering. To avoid confounding effect, any equity offerings that occur less than three quarters before or after other equity offerings are excluded. The investment is measured by the change in each REIT's net real estate investment scaled by one quarter lagged total assets. The solid line shows the investment of the unconstrained REITs and the dashed line represents the investment of the constrained REITs. The investment of the constrained REITs is drawn separately in two additional lines depending on financing conditions. The one-dotted line is the investment of constrained REITs under high financing conditions and the two-dotted line is the investment of constrained REITs under low financing conditions.

quarter 0.[4] This exercise is to provide a general idea of how equity offerings, credit lines, and investments interact together. I separate the full sample into financially constrained and unconstrained REITs based on the composite index explained in the section 3.2.

[4] This empirical approach is similar to the one used by Ooi, Wong, and Ong (2012) who investigate the quarterly changes in credit lines around material investments, but it is different in that cash savings, credit lines, and investments are compared together around the equity offering.

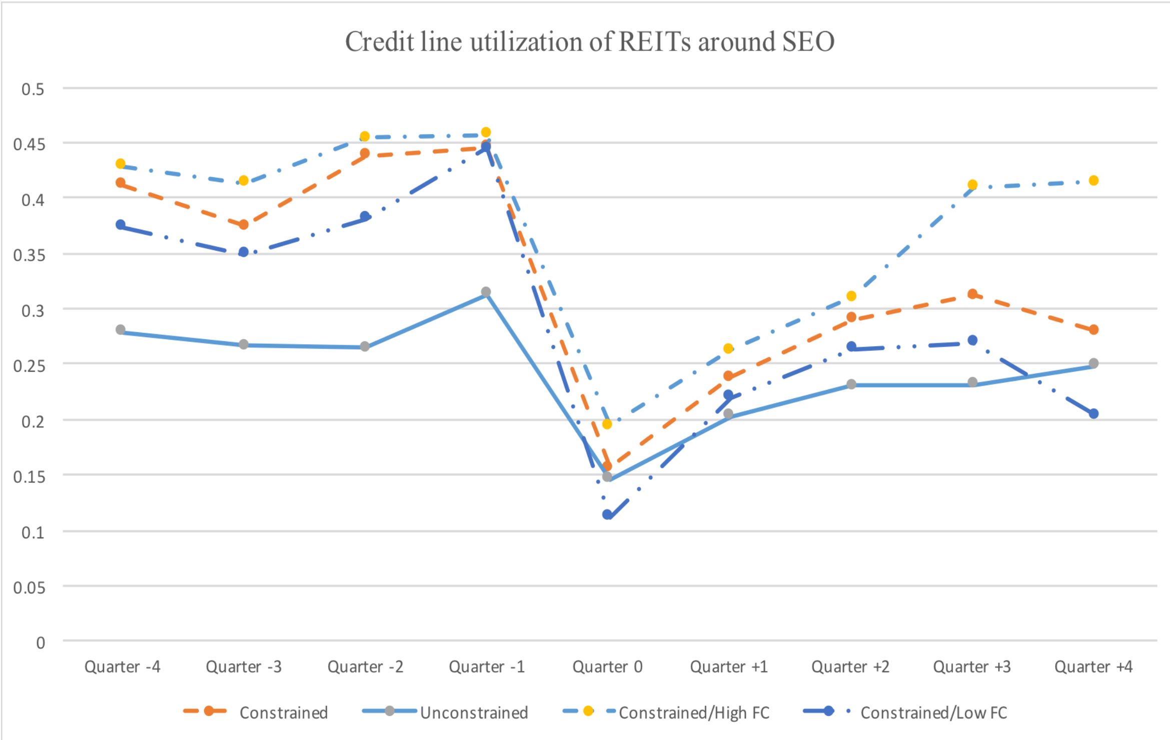

Figure 3.4. The figure shows the credit line drawdowns around a seasoned equity offering. To avoid confounding effect, any equity offerings that occur less than three quarters before or after other equity offerings are excluded. The credit line drawdown is measured by the amount of credit line scaled by the total size of credit line. The solid line shows the credit line drawdown of the unconstrained REITs and the dashed line represents the drawdown of the constrained REITs. The credit line drawdown of the constrained REITs is drawn separately in two additional lines depending on financing conditions. The one-dotted line is the credit line drawdown of constrained REITs under high financing conditions and the two-dotted line is credit line drawdown of constrained REITs under low financing conditions.

First, Figure 3.2 shows that cash savings from equity offerings persist no longer than one quarter after the offering in both constrained and unconstrained groups. This finding is consistent with the assumption that cash savings are not a sustainable option for REITs to manage liquidity to support investments. Second, the investment activities around equity offerings are much higher for constrained REITs than unconstrained REITs as shown in Figure 3.3. That is, the constrained REITs appear to heavily rely on equity offerings for their investments than the unconstrained REITs. The investment patterns of the constrained REITs become more interesting when I divide the constrained group into low and high financing conditions. The constrained REITs under low financing conditions start material investments with equity offerings and keep investing up to four quarters after equity offerings. In contrast, the constrained REITs under high financing conditions actively invest before and after equity offerings. The findings suggest that constrained REITs may adjust the order of accessing seasoned equities and credit lines in accordance with the time-varying financing conditions. lastly, Figure 3.4 indicates that the constrained REITs pay down credit lines using equity offerings significantly more than the unconstrained REITs. It is also notable that credit lines do not show any significant drawdowns over about one-year period before the equity offerings, whereas credit lines are utilized over four quarters after the equity offerings.

The three charts provide some suggestive evidence for the potential interplay between credit lines and equity offerings. However, it is not clear how time-varying financing conditions create variations in that interplay of the two liquidity sources. Thus, I further test the relation using multivariate regression analyses as discussed in the section 4.2.

3.4.2. Regression analysis

In this section, I discuss the regression model specifications and report main findings. Section 4.2.1 reports estimates of investment sensitivity to financing conditions and estimates of external financing sensitivity to financing conditions respectively. Section 4.2.2 reports estimates of investment sensitivity to equity issuance and credit lines. Section 4.2.3 presents the credit line repayment rate for equity issuance. In Section 4.2.4, I test the relation between credit line drawdowns and prior equity issuances.

Impact of Time-varying Financing Conditions on Investment and Financing Activities

To find whether the impact of financing conditions on investments and external financing activities vary according to the financial constraints, I modify the regression models proposed by McLean and Zhao (2014) as follows:

$$\begin{aligned}\text{Investment}_{\text{it}} = {} & \alpha_i + \alpha_t + \beta_1 \text{Constrained}_{\text{it}} \\ & + \beta_2 \text{Constrained}_{\text{it}} {}^* \text{Financing Condition}_{\text{t}} + \varepsilon_{\text{it}}\end{aligned} \tag{4}$$

$$\begin{aligned}&Equity\ \text{Issuance}_{\text{it}} \\ &\quad = \alpha_i + \alpha_t + \beta_1 \text{Constrained}_{\text{it}} + \beta_2 \text{Constrained}_{\text{it}} {}^* \text{Financing Condition}_{\text{t}} + \varepsilon_{\text{it}}\end{aligned} \tag{5}$$

$$\begin{aligned}&\text{Debt Issuance}_{\text{it}} \\ &\quad = \alpha_i + \alpha_t + \beta_1 \text{Constrained}_{\text{it}} + \beta_2 \text{Constrained}_{\text{it}} {}^* \text{Financing Condition}_{\text{t}} \\ &\quad + \varepsilon_{\text{it}}\end{aligned} \tag{6}$$

Model (4) is intended to test whether financially constrained REITs have higher sensitivity of investment to financing conditions compared to financially unconstrained REITs.

Model (5) and (6) are intended to test whether financially constrained REITs have equity or debt issuance that is more sensitive to financing conditions compared to financially unconstrained REITs. The $\text{Constrained}_{\text{it}}$ is a dummy variable that indicates the financial constraints. Note that the $\text{Financing Condition}_{\text{t}}$ is excluded from the specification because the included quarter effect (α_t) already captures the time variation of financing condition variable.

Table 3.3

Financing Condition and Investment

The regression model is

$$\text{Investment}_{it} = \alpha_i + \alpha_t + \beta_1 \text{Constrained}_{it} + \beta_2 \text{Constrained}_{it} * \text{Financing Condition}_t + \varepsilon_{it}$$

VARIABLES	(1) Rating	(2) Market Cap.	(3) Int. Cov. Ratio	(4) Composite 1	(5) Composite 2
Constrained	0.00143	-0.0116***	-0.0123***	-0.00822*	-0.0174***
	(0.00480)	(0.00430)	(0.00393)	(0.00422)	(0.00491)
Constrained*Financing Condition	0.0221***	0.0142*	0.0151*	0.0180**	0.0294***
	(0.00802)	(0.00814)	(0.00810)	(0.00807)	(0.00994)
Observations	6,846	6,846	6,846	6,846	6,846
R-squared	0.048	0.046	0.047	0.046	0.047
Number of Firms	184	184	184	184	184
Firm FE	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES

Note: The table reports regression results in which the dependent variable is investment. The independent variables are a financial constraint dummy variable and interaction between the financial constraint variable and the financing condition variable. I perform the regression using five different constraint variables: 1) Rating, 2) Market capitalization, 3) Interest coverage ratio, 4) Composite 1, 5) Composite 2. See section 3.2 for the individual definition of constraint variables. The regression includes firm and quarter effects. Standard errors are clustered on both firm and quarter. R-squared reflect within-firm variations. Robust t-statistics are reported in the parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

Table 3.3 reports the estimates of Equation (4). In regressions 1 to 5, the constrained coefficients are all negative except one and four of them are significant, while the interaction terms are all positive and significant. The results show that financially constrained REITs invest more when financing costs are low, but less when financing conditions are tight.

Table 3.4

Financing Condition and Equity Offerings

The regression model is

$$\text{Share Issuance}_{\text{it}} = \alpha_i + \alpha_t + \beta_1 \text{Constrained}_{\text{it}} + \beta_2 \text{Constrained}_{\text{it}} * \text{Financing Condition}_{\text{t}} + \varepsilon_{\text{it}}$$

VARIABLES	(1) Rating	(2) Market Cap.	(3) Int. Cov. Ratio	(4) Composite 1	(5) Composite 2
Constrained	-0.00618*	-0.00740***	0.00110	-0.00517*	-0.00749**
	(0.00334)	(0.00275)	(0.00242)	(0.00269)	(0.00309)
Constrained*Financing Condition	0.0191***	0.0192***	0.00370	0.0186***	0.0266***
	(0.00552)	(0.00561)	(0.00554)	(0.00554)	(0.00694)
Observations	6,846	6,846	6,846	6,846	6,846
R-squared	0.023	0.023	0.022	0.023	0.024
Number of Firms	184	184	184	184	184
Firm FE	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES

Note: The table reports regression results in which the dependent variable is equity issuance. The independent variables are a financial constraint dummy variable and interaction between the financial constraint variable and the financing condition variable. I perform the regression using five different constraint variables: 1) Rating, 2) Market capitalization, 3) Interest coverage ratio, 4) Composite 1, 5) Composite 2. See section 3.2 for the individual definition of constraint variables. The regression includes firm and quarter effects. Standard errors are clustered on both firm and quarter. R-squared reflect within-firm variations. Robust t-statistics are reported in the parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

Table 3.4 and Table 3.5 shows the estimates of Equation (5) and (6) that use equity issuance and debt issuance as dependent variable respectively. In regressions for equity issuance, the constrained coefficients are all negative and significant while the interaction terms are all positive and significant except the regression (3). In contrast, the regressions for debt issuance in Table 5 shows that the constrained and interaction terms show no significant effects on debt issuance. The results indicate that financing conditions have higher effects on equity financing

Table 3.5

Financing Condition and Debt Offerings

The regression model is

$$\text{Debt Issuance}_{\text{it}} = \alpha_i + \alpha_t + \beta_1\text{Constrained}_{\text{it}} + \beta_2\text{Constrained}_{\text{it}} * \text{Financing Condition}_{\text{t}} + \varepsilon_{\text{it}}$$

VARIABLES	(1) Rating	(2) Market Cap.	(3) Int. Cov. Ratio	(4) Composite 1	(5) Composite
Constrained	-0.00880***	-0.00282	-0.00130	-0.00283	-0.00102
	(0.00213)	(0.00176)	(0.00155)	(0.00172)	(0.00197
Constrained*Financing Condition	-0.00461	-0.00235	0.00259	-0.00122	-0.00162
	(0.00352)	(0.00358)	(0.00354)	(0.00354)	(0.00444
Observations	6846	6846	6846	6846	6846
R-squared	0.023	0.023	0.022	0.023	0.024
Number of Firms	184	184	184	184	184
Firm FE	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES

Note: The table reports regression results in which the dependent variable is debt issuance. The independent variables are a financial constraint dummy variable and interaction between the financial constraint variable and the financing condition variable. I perform the regression using five different constraint variables: 1) Rating, 2) Market capitalization, 3) Interest coverage ratio, 4) Composite 1, 5) Composite 2. See section 3.2 for the individual definition of constraint variables. The regression includes firm and quarter effects. Standard errors are clustered on both firm and quarter. R-squared reflect within-firm variations. Robust t-statistics are reported in the parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

than debt financing. This is consistent with the findings by McLean and Zhao (2014) for non-REIT firms.

Taken together, the findings indicate that increased external financing costs generally force financially constrained REITs to reduce equity issuance and thus lower their investments when financing conditions remain tight.

Sensitivity of Investments to Liquidity Sources

To test whether financially constrained REITs rely more on seasoned equities and credit lines to finance their investments as external financing costs increase, I regress investment on the proceeds of seasoned equity offering and change in credit line drawdowns, including other funding sources such as preferred equity and public debt. To control debt overhang issues, one quarter lagged cash savings and unused credit line are added. The Tobin's Q is a market to book ratio which controls investment opportunities. The firm size is a logged variable of total assets. Except Tobin's Q, all variables are normalized by the size of total asset at the beginning of quarter. The regression also includes firm and quarter effects. The sensitivity of investment to credit lines and equity issue can be estimated as follows:

$$\begin{aligned} Investment_{it} = {} & \alpha_i + \alpha_t + \beta_1 Common\ Equity\ Issuance_{it} \\ & + \beta_2 Common\ Equity\ Issuance_{it} {*} Financing\ Condition_t \\ & + \beta_3 \Delta Credit\ Line\ Use_{it} + \beta_4 \Delta Credit\ Line\ Use_{it} {*} Financing\ Condition_t \\ & + \beta_5 Retained\ Cash_{it} + \beta_6 Preferred\ Eqity\ Issuance_{it} \\ & + \beta_7 Public\ Debt\ Issuance_{it} + \beta_8 Unused\ Credit\ Line_{it\text{-}1} + \beta_9 Cash_{it\text{-}1} \\ & + \beta_{10} Q_{it\text{-}1} + \beta_{11} Firm\ Size_{it} + \varepsilon_{it} \end{aligned} \tag{7}$$

In specific, I add two interaction terms to identify whether financing conditions lower or raise the sensitivity of investments to equity issuances or credit line drawdowns. Thus, the coefficients of $\mathrm{Common\ Equity\ Issuance_{it}{*}Financing\ Condition_t}$ and $\Delta Credit\ Line\ Use_{it}{*}Financing\ Condition_t$ are of main interest in this first regression analysis. If the coefficient on the interaction term is negative, it means that REITs rely more on equity issuances and credit lines as financing conditions weaken.

Table 3.6

Sensitivity of Investments to Liquidity Sources

The regression model is

$$Investment_{it} = \alpha_i + \alpha_t + \beta_1 Common\ Equity\ Issuance_{it}$$
$$+ \beta_2 Common\ Equity\ Issuance_{it} * Financing\ Condition_t + \beta_3 \Delta Credit\ Line\ Use_{it}$$
$$+ \beta_4 \Delta Credit\ Line\ Use_{it} * Financing\ Condition_t + \beta_5 Retained\ Cash_{it}$$
$$+ \beta_6 Preferred\ Eqity\ Issuance_{it} + \beta_7 Public\ Debt\ Issuance_{it}$$
$$+ \beta_8 Unused\ Credit\ Line_{it-1} + \beta_9 Cash_{it-1} + \beta_{10} Q_{it-1} + \beta_{11} Firm\ Size_{it} + \varepsilon_{it}.$$

Panel A. Constrained REITs

	(1) Rating	(2) Market Cap.	(3) Int. Coverage Ratio	(4) Composite 1	(5) Composite 2
Common Equity Issuance	0.867***	0.732***	0.971***	0.857***	1.263***
	(0.0782)	(0.0748)	(0.0796)	(0.0753)	(0.360)
Common Equity Issuance*Financing Condition	-0.690***	-0.408***	-0.974***	-0.718***	-1.520***
	(0.160)	(0.154)	(0.167)	(0.155)	(0.574)
ΔCredit Line Use	0.679***	0.599***	0.803***	0.693***	1.119***
	(0.0736)	(0.0705)	(0.0777)	(0.0726)	(0.251)
ΔCredit Line Use*Financing Condition	-0.209	-0.113	-0.481***	-0.271*	-1.065**
	(0.148)	(0.142)	(0.147)	(0.144)	(0.475)
Ratined Cash	0.698***	0.591***	0.688***	0.591***	0.677***
	(0.0767)	(0.0834)	(0.0814)	(0.0816)	(0.236)
Preferred Equity Issuance	0.292***	0.250***	0.309***	0.259***	0.269***
	(0.0545)	(0.0536)	(0.0601)	(0.0542)	(0.0804)
Public Debt Issuance	0.404***	0.250***	0.307***	0.133**	0.517*
	(0.104)	(0.0536)	(0.0457)	(0.0669)	(0.306)
Unused Credit Line (t-1)	0.304***	0.271***	0.341***	0.296***	0.314***
	(0.0237)	(0.0228)	(0.0294)	(0.0230)	(0.0877)
Cash (t-1)	0.0293	0.0433**	0.0465**	0.0393**	0.0209
	(0.0202)	(0.0197)	(0.0214)	(0.0197)	(0.0409)
Q (t-1)	0.0370***	0.0489***	0.0590***	0.0413***	0.0734***
	(0.00873)	(0.00871)	(0.0101)	(0.00886)	(0.0257)
Firm Size	0.0189***	0.0190***	0.0180***	0.0184***	0.0277**
	(0.00402)	(0.00425)	(0.00360)	(0.00397)	(0.0120)
Observations	3,368	3,340	3,332	3,348	1,446
R-squared	0.308	0.301	0.300	0.307	0.363
Number of Firms	123	139	165	146	78
Firm FE	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES

Table 3.6

Continued

Panel B. Unconstrained REITs

	(1) Rating	(2) Market Cap.	(3) Int. Coverage Ratio	(4) Composite 1	(5) Composite 2
Common Equity Issuance	-0.188***	0.0868	0.145**	-0.183**	0.175***
	(0.0721)	(0.0829)	(0.0722)	(0.0779)	(0.0608)
Common Equity Issuance*Financing Condition	1.839***	1.092***	0.984***	1.855***	0.900***
	(0.162)	(0.184)	(0.150)	(0.172)	(0.128)
ΔCredit Line Use	0.280***	0.320***	0.303***	0.265***	0.319***
	(0.0558)	(0.0607)	(0.0595)	(0.0583)	(0.0496)
ΔCredit Line Use*Financing Condition	0.557***	0.546***	0.557***	0.659***	0.513***
	(0.115)	(0.126)	(0.129)	(0.122)	(0.104)
Ratined Cash	0.598***	0.909***	0.546***	0.814***	0.647***
	(0.0881)	(0.0768)	(0.0901)	(0.0786)	(0.0701)
Preferred Equity Issuance	0.361***	0.506***	0.293***	0.431***	0.310***
	(0.0650)	(0.0708)	(0.0546)	(0.0648)	(0.0479)
Public Debt Issuance	0.375***	0.423***	0.373***	0.429***	0.364***
	(0.0215)	(0.0254)	(0.0304)	(0.0241)	(0.0234)
Unused Credit Line (t-1)	0.358***	0.536***	0.269***	0.393***	0.273***
	(0.0290)	(0.0345)	(0.0224)	(0.0315)	(0.0203)
Cash (t-1)	0.0568***	0.0328*	0.0305*	0.0248	0.0495***
	(0.0162)	(0.0172)	(0.0165)	(0.0173)	(0.0133)
Q (t-1)	0.0316***	0.0377***	0.0355***	0.0349***	0.0363***
	(0.00544)	(0.00616)	(0.00619)	(0.00603)	(0.00477)
Firm Size	0.0147***	0.0146***	0.00988***	0.0159***	0.0118***
	(0.00237)	(0.00252)	(0.00300)	(0.00258)	(0.00213)
Observations	3,457	3,485	3,493	3,477	5,137
R-squared	0.397	0.387	0.366	0.398	0.354
Number of Firms	100	109	167	117	153
Firm FE	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES

Note: The table reports regression results in which the dependent variable is investment. The major independent variables are funding sources for investment which include common equity issuance, retained cash, change of credit line drawdown, preferred equity issuance, and public debt issuance. To control debt overhang issues, one quarter lagged cash savings and unused credit line are added. The Tobin's Q is a market to book ratio which controls investment opportunities. The firm size is a logged variable of total assets. Except Tobin's Q, all variables are normalized by the size of total asset at the beginning of quarter. The regression includes firm and quarter effects. Standard errors are clustered on both firm and quarter. R-squared reflect within-firm variations. Robust t-statistics are reported in the parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

Table 3.6 reports the estimates of Equation (7) for the constrained group in Panel A and for the unconstrained group in Panel B. The estimated parameters for the two interaction terms are strikingly different between the constrained and unconstrained groups. The two interactions are all negative in the constrained group, but all positive in the unconstrained group. The negative sign on $Common\ Equity\ Issuance_{it}$*$Financing\ Condition_t$ suggests that the constrained REITs have to rely more on equity issuances as financing conditions worsen because access to debt financing become more restrictive. For instance, in regression 5, if financing condition is low, then the overall equity issuance coefficient is 1.11 (1.28+(-1.52)*(0.11)=1.11). Alternatively, if the financing condition is high, then the overall equity issuance coefficient is decreased to 0.14 (1.28+(-1.52)*(0.75)=0.14). In contrast, the positive sign on $Common\ Equity\ Issuance_{it}$*$Financing\ Condition_t$ indicates that the unconstrained REITs tend to time the market by issuing equities to finance investments when the equity costs are low, while avoiding issuing equities when the incurring costs are high.

The negative sign on $\Delta Credit\ Line\ Use_{it}$*$Financing\ Condition_t$ indicates that the constrained REITs also increase reliance on credit line to fund investments during tighter financing conditions. The interpretation of increasing reliance of the constrained REITs on credit lines during low financing conditions requires extra attention because the result can draw two totally different conclusions. The first possible explanation is that credit lines are able to support investments instead of external financing. This conclusion may be supported by the prior studies that emphasize the role of credit lines as an insurance to financial shocks. In contrast, another plausible explanation is that credit lines are more actively utilized to reserve cash from equity offerings in the form of unused credits during tighter financing conditions. The high investment sensitivity to credit line drawdowns only reflect the increased interaction between equity offerings and credit lines.

To further investigate whether credit lines can support investments while equity finance is postponed, I examine the credit line repayment rate from the proceeds of equity offerings in section 4.2.3. If the role of credit lines as an independent financing source strengthens during low financing conditions, there should be decreasing activities of repaying credit lines from equity offerings.

Credit Line Repayment Rate from Equity Issuance

The previous section shows that equity issuance and credit lines become more valuable to the constrained REITs in low financing conditions. In this section, I estimate whether the relation between equity issuance and credit lines become stronger or weaker with the changes in financing conditions. In specific, I estimate the credit line repayment rate to the proceeds of equity issuances. The sensitivity of credit line repayments to equity issuances are calculated as:

$$\begin{aligned}
\Delta Unused\ Credit\ Line_{\mathrm{it}} &= \alpha_i + \alpha_t + \beta_1 Unused\ Credit\ Line_{it\text{-}1} + \beta_2 \mathrm{Common\ Equity\ Issuance_{it}} \\
&+ \beta_3 \mathrm{Common\ Equity\ Issuance_{it}} * \mathrm{Financing\ Condition_t} \\
&+ \beta_4 Retained\ Cash_{it} + \beta_5 Preferred\ Eqity\ Issuance_{it} \\
&+ \beta_6 Public\ Debt\ Issuance_{it} + \beta_7 Other_{it\text{-}1} \\
&+ \beta_8 \Delta Size\ of\ Total\ Credt\ Line_{it\text{-}1} + \beta_9 Q_{it\text{-}1} + \beta_{10} Firm\ Size_{it} + \varepsilon_{\mathrm{it}}
\end{aligned} \quad (8)$$

The major independent variables are cash sources for repaying credit line use, which include common equity issuance, retained cash, preferred equity issuance, public debt issuance, and cash from sales of assets (Other). Change in size of total credit line is a variable to measure the increase or decrease of total credit lines through negotiations between firms and banks.

Table 3.7 reports the estimates of Equation (8) for the constrained group in Panel A and for the unconstrained group in Panel B. In general, all cash sources appear to contribute to reducing the drawdowns of credit lines in both constrained and unconstrained REITs. However, the interaction term between equity issuance and financing conditions has very different coefficients for constrained and unconstrained REITs. The signs on $\text{Common Equity Issuance}_{it}\text{*Financing Condition}_{t}$ are all negative and significant for constrained REITs, but the coefficient for unconstrained REITs is not statistically significant. The negative sign on the interaction means that the constrained REITs heavily rely on seasoned equity issuances to pay down credit lines drawdowns as financing conditions become tighter. The behavior of REITs that increase the credit capacity in credit lines using equity offerings during low financing conditions is completely different from the precautionary cash savings of non-REIT firms. While the non-REIT firms save cash from equity offerings when financing costs are low, the financially constrained REITs issue equities to pay drawdowns of credit lines when financing costs are high.

Taken together with the results in section 4.2.2, these findings provide important evidence that credit lines support investments jointly with equity offerings, not alone. However, there is a slight possibility that credit lines are fully utilized first and then the drawdowns of credit lines are paid off using equity offerings. In the next section, I investigate this possibility by testing the order of accessing credit lines and seasoned equities during low financing conditions.

Table 3.7

Financing Condition and Change of Unused Credit Line

The regression model is

$$\Delta Unused\ Credit\ Line_{\mathrm{it}} = \alpha_i + \alpha_t + \beta_1 Unused\ Credit\ Line_{it-1} + \beta_2 \text{Common Equity Issuance}_{\mathrm{it}} + \beta_3 \text{Common Equity Issuance}_{\mathrm{it}} * \text{Financing Condition}_{\mathrm{t}} + \beta_4 Retained\ Cash_{it} + \beta_5 Preferred\ Eqity\ Issuance_{it} + \beta_6 Public\ Debt\ Issuance_{it} + \beta_7 Other_{it-1} + \beta_8 \Delta Size\ of\ Total\ Credt\ Line_{it-1} + \beta_9 Q_{it-1} + \beta_{10} Firm\ Size_{it} + \varepsilon_{\mathrm{it}}$$

Panel A. Constrained REITs

	(1) Rating	(2) Market Cap.	(3) Int. Coverage Ratio	(4) Composite 1	(5) Composite 2
Unused Credit Line (t-1)	-0.247***	-0.248***	-0.252***	-0.245***	-0.293***
	(0.0356)	(0.0352)	(0.0414)	(0.0363)	(0.0618)
Common Equity Issuance	0.904***	0.786***	0.557***	0.879***	0.409**
	(0.156)	(0.162)	(0.161)	(0.165)	(0.186)
Common Equity Issuance*Financing Condition	-0.765***	-0.617***	-0.389*	-0.746***	-0.192
	(0.201)	(0.210)	(0.211)	(0.211)	(0.245)
Retained Cash	0.172**	0.235***	0.234***	0.233***	0.165***
	(0.0662)	(0.0644)	(0.0407)	(0.0624)	(0.0535)
Preferred Equity Issuance	0.202***	0.181***	0.211***	0.173**	0.217***
	(0.0689)	(0.0633)	(0.0644)	(0.0671)	(0.0706)
Public Debt Issuance	0.363***	0.281***	0.300***	0.245***	0.239***
	(0.130)	(0.0575)	(0.0531)	(0.0697)	(0.0717)
Other	0.193***	0.198***	0.159***	0.188***	0.137***
	(0.0292)	(0.0314)	(0.0261)	(0.0317)	(0.0346)
ΔSize of Total Credit Line	0.658***	0.620***	0.610***	0.634***	0.557***
	(0.0600)	(0.0598)	(0.0507)	(0.0609)	(0.0770)
Q (t-1)	0.00759	0.00801	0.00712	0.00487	0.0209
	(0.00867)	(0.00919)	(0.00886)	(0.00948)	(0.0140)
Firm Size	-0.00806**	-0.0107**	-0.00722*	-0.00866**	-0.0115*
	(0.00368)	(0.00434)	(0.00390)	(0.00361)	(0.00677)
Observations	3,144	3,102	3,182	3,114	1,422
R-squared	0.474	0.465	0.437	0.471	0.463
Number of Firms	97	111	139	116	73
Firm FE	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES

Table 3.7

Continued

Panel B. Unconstrained REITs

	(1) Rating	(2) Market Cap.	(3) Int. Coverage Ratio	(4) Composite 1	(5) Composite 2
Unused Credit Line (t-1)	-0.232***	-0.228***	-0.229***	-0.249***	-0.213***
	(0.0207)	(0.0186)	(0.0243)	(0.0226)	(0.0179)
Common Equity Issuance	-0.108	0.103	0.543*	-0.134	0.577***
	(0.203)	(0.266)	(0.285)	(0.209)	(0.221)
Common Equity Issuance*Financing Condition	0.554*	0.282	-0.233	0.620**	-0.316
	(0.283)	(0.355)	(0.377)	(0.283)	(0.291)
Retained Cash	0.329***	0.188***	0.104	0.184***	0.183***
	(0.0490)	(0.0707)	(0.0686)	(0.0701)	(0.0686)
Preferred Equity Issuance	0.208***	0.295***	0.199**	0.288***	0.195***
	(0.0538)	(0.0726)	(0.0830)	(0.0608)	(0.0735)
Public Debt Issuance	0.351***	0.375***	0.371***	0.377***	0.349***
	(0.0333)	(0.0339)	(0.0334)	(0.0327)	(0.0335)
Other	0.262***	0.243***	0.267***	0.261***	0.244***
	(0.0287)	(0.0240)	(0.0310)	(0.0265)	(0.0249)
ΔSize of Total Credit Line	0.632***	0.734***	0.688***	0.690***	0.686***
	(0.0453)	(0.0465)	(0.0550)	(0.0491)	(0.0443)
Q (t-1)	0.000396	0.00370	0.00281	0.00265	0.00171
	(0.00618)	(0.00540)	(0.00657)	(0.00599)	(0.00507)
Firm Size	-0.00856**	-0.00864***	-0.00913***	-0.0105***	-0.00748***
	(0.00331)	(0.00208)	(0.00338)	(0.00250)	(0.00267)
Observations	3,471	3,513	3,433	3,501	5,193
R-squared	0.463	0.472	0.487	0.478	0.467
Number of Firms	92	103	143	108	147
Firm FE	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES

Note: The table reports regression results in which the dependent variable is change of unused credit line. The major independent variables are cash sources for repaying credit line use, which include common equity issuance, retained cash, preferred equity issuance, public debt issuance, and cash from sales of assets (Other). Change of total credit line is a variable to measure the increase or decrease of total credit lines through negotiations between firms and banks. The Tobin's Q is a market to book ratio which controls investment opportunities. Except Tobin's Q, all variables are normalized by the size of total asset at the beginning of quarter. The regression includes firm and quarter effects. Standard errors are clustered on both firm and quarter. R-squared reflect within-firm variations. Robust t-statistics are reported in the parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

Accessing Order of Credit Line and Seasoned Equity

In the section 4.2.3, I examined the relation between equity issuance and credit lines focusing on the credit line repayment activities. In this section, I investigate whether financing conditions create a variation in the relation in terms of the order of accessing seasoned equities and credit lines. The order of accessing credit lines and seasoned equities can be inferred from the sensitivity of changes in credit line drawdown to lagged proceeds of equity issues:

$$\begin{aligned}\Delta Credit\ Line\ Use_{\mathrm{it}} \\ &= \alpha_i + \alpha_t \\ &+ \beta_1 Common\ Equity\ Issuance_{it} + \beta_2 Common\ Equity\ Issuance_{it\text{-}1} \\ &+ \beta_3 Common\ Equity\ Issuance_{it\text{-}2} + \beta_4 Common\ Equity\ Issuance_{it\text{-}3} \\ &+ \beta_5 Common\ Equity\ Issuance_{it\text{-}4} + \varepsilon_{\mathrm{it}}\end{aligned} \tag{9}$$

Since financing conditions cannot directly interact with equity issuance variable in the model specification, I first subdivide each constrained and unconstrained REIT into two subgroups based on the median of composite index for financing conditions. The results in Column 3 of Table 3.8 reports that the equity offerings lead to positive credit line drawdowns up to three quarters after the issuances when the constrained REITs are under low financing conditions. When the constrained REITs face high financing conditions, the effects of equity offerings on the credit line drawdowns last only one quarter after the issuance. The persistent impact of equity offerings on credit line drawdowns cannot be found for the unconstrained REITs either under high or low financing conditions. The results reported in Table 3.8 are based on a composite index for the classification of financial constraints, but I observe similar patterns when other financial constraint proxy variables are used to divide constrained and unconstrained groups. The findings provide strong evidence against the bridge loan hypothesis by confirming

Table 3.8

Credit Line Drawdowns and Seasoned Equity Issuance

The regression model is

$$\Delta Credit\ Line\ Use_{\text{it}} = \alpha_i + \alpha_t + \beta_1 Common\ Equity\ Issuance_{it} + \beta_2 Common\ Equity\ Issuance_{it-1} + \beta_3 Common\ Equity\ Issuance_{it-2} + \beta_4 Common\ Equity\ Issuance_{it-3} + \beta_5 Common\ Equity\ Issuance_{it-4} + \varepsilon_{\text{it}}$$

	Unconstrained REITs		Constrained REITs	
	(1)	(2)	(3)	(4)
VARIABLES	Low Financing Condition	High Financing Condition	Low Financing Condition	High Financing Condition
Common Equity Issuance (t)	-0.199***	-0.141***	**-0.264*** **	-0.165***
	(0.0296)	(0.0426)	**(0.0250)**	(0.0364)
Common Equity Issuance (t-1)	0.109***	0.0556	**0.0592** **	0.0620*
	(0.0289)	(0.0405)	**(0.0237)**	(0.0352)
Common Equity Issuance (t-2)	0.0234	-0.00872	**0.0484***	0.0460
	(0.0300)	(0.0353)	**(0.0251)**	(0.0310)
Common Equity Issuance (t-3)	-0.0181	-0.000188	**0.0541** **	0.00949
	(0.0292)	(0.0323)	**(0.0233)**	(0.0305)
Common Equity Issuance (t-4)	0.0373	0.0771**	0.00255	-0.0414
	(0.0285)	(0.0301)	(0.0230)	(0.0309)
Observations	1,653	1,495	1,646	1,356
R-squared	0.069	0.034	0.118	0.061
Number of Firms	101	109	134	136
Firm FE	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES

Note: The table reports regression results in which the dependent variable is the drawdowns of credit lines. The major independent variables are current and lagged common equity. The regression includes firm and quarter effects. Standard errors are clustered on both firm and quarter. R-squared reflect within-firm variations. Robust t-statistics are reported in the parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

that constrained REITs are more likely to access seasoned equities first and utilize credit lines subsequently under tight financing conditions.

Overall, REITs, in specific the financially constrained REITs, respond to the time-varying financing conditions by adjusting the level of unused credit lines using the seasoned equity proceeds but also altering the order of accessing credit lines and seasoned equities.

3.5. Summary

It is widely known that REITs actively use credit lines for their short-term liquidity requirements and adjust the level of drawdowns of credit lines by raising external funds, especially public debts. This study shows that this so-called bridge loan hypothesis is too generalized to take a full picture of REIT liquidity policies. I find that the time-varying financing conditions primarily affect the liquidity policies of financially constrained REITs that heavily rely on equity offerings for their liquidity source, but not those of unconstrained REITs that can access relatively diverse funding sources other than equities. In addition, the stochastic financing conditions create interesting variations in the interplay between credit lines and equity offerings in two different ways. First, the falling financing conditions lead constrained REITs to rely more on equity offerings to repay their credit lines as financing condition weakens. That is, constrained REITs reserve a large portion of the offering proceeds as unused credit lines during low financing conditions. Second, the financing conditions alter the order of accessing credit lines and seasoned equities. During low financing conditions, constrained REITs are more likely to utilize credit lines after raising equities rather than prior to the offerings. Overall, the evidence on the relation between credit lines and equity offerings indicate that REITs do not follow the way predicted by a traditional bridge loan hypothesis when they are financially constrained and also the financing conditions become tighter.

4. CHAPTER FOUR

CONCLUSION

4.1. Conclusion of Findings

Prior studies focused on capturing the effects of aggregate capital flows on commercial real estate investment markets as a whole by mainly testing the statistical association between capital flows and real estate asset prices. However, the empirical findings that failed to build from a theoretical framework did not receive much scholarly attention and practitioner engagement. In this study, I narrowed down the scope of study into the impact of capital flows on investment performance and liquidity management behavior of real estate funds while precisely defining the routes through which capital flows are likely to affect real estate investment markets. Two different aspects of capital flows are identified from prior theoretical works: cross-sectional variation and inter-temporal variation.

In chapter two, I investigated the impact of capital flows, which are allocated cross-sectionally by heterogeneous investors, on performance of private equity real estate funds. I developed hypotheses that heterogeneous investors create cross-sectional variation of capital flows into private equity real estate funds and, in consequence, the differential growth of funds affects performance of private equity real estate funds. The theoretical framework that links fund performance to the growth of funds was developed by Glode and Green (2011) and Hochberg *et al.* (2010), but empirical findings were not always consistent with their theoretical predictions. I found that the assumption that all institutional investors are sophisticated is responsible for inconclusive empirical results. The assumption posits that all investors generally have abilities to force fund managers to limit the growth of follow-on funds. To loosen the assumption of homogeneous investors under which recent empirical studies were performed, I argued that institutional investors are heterogeneous in the level of sophistication.

The results showed that there are sophisticated and unsophisticated investors among institutional investors. Foundations showed the characteristics of sophisticated investors but other type of investors did not reveal the same level of sophistication. Once I separated funds into the two groups depending on the participation of sophisticated investors, the funds invested in by sophisticated investors have a weak fund size-performance relation and show strong performance persistence, while the funds invested in by unsophisticated investors have a strong fund size-performance relation and no performance persistence. As a result, the findings support the theoretical argument that fund growth is a key factor that accounts for performance persistence and also confirm that the previous discrepancy between theoretical prediction and empirical findings comes from ignoring the important fact that fund growth of private equity real estate funds hinges on which type of investors participate in those funds.

In chapter three, to understand the impact of capital flows on REITs' management behavior, I paid special attention to the time-varying financing conditions created by fluctuating capital flows into REIT markets. Although the impact of time-varying financing conditions on ordinary firm's liquidity management has drawn great attention lately in the finance literature, the impact specifically on REIT's liquidity management has not been well documented. Thus, I examined how time-varying equity financing conditions influence the liquidity managements of REITs to distinguish unique features of liquidity management styles represented by REITs compared to ordinary firms.

My first question was which type of REITs is sensitive to the inter-temporal variation of capital flows. The results showed that the time-varying financing conditions primarily affect the liquidity policies of financially constrained REITs that heavily rely on equity offerings for their liquidity source, but not those of unconstrained REITs that can access relatively diverse funding sources other than equities. Next, I examined how financially constrained REITs manage liquidity when their financing conditions significantly vary over time. The results suggest that the stochastic financing conditions create interesting variations in the interplay between credit lines and equity offerings in two different ways. First, the tight financing conditions lead constrained REITs to rely more on equity offerings to repay their credit lines. That is, constrained REITs reserve a large portion of the offering proceeds as an unused credit lines under unfavorable financing conditions. Reserving financing capacity in credit lines by REITs is not observed in the case of ordinary firms. The ordinary firms generally save cash from equity offerings. Second, the financing conditions alter the order of accessing credit lines and seasoned equities. As finance costs rise, constrained REITs are more likely to utilize credit lines after raising equities rather than prior to the offerings. The analyses of the interplay between equity offerings and credit lines suggest that the increased access to credit lines during recessions should not be interpreted as evidence that credit lines independently mitigate the negative financial shocks. In fact, without a preemptive injection of equity offering proceeds into credit lines, access to credit lines is limited to the financially constrained REITs during low financing conditions.

These results indicate that REITs are significantly different from other ordinary firms in terms of liquidity management in that REITs increase unused capacity of credit lines instead of saving cash from equity offering. In addition, the results suggest that REITs do not follow the way predicted by a traditional bridge loan hypothesis that has been supported by existing studies.

4.2. Implications

My work provides a more robust explanation than existing studies regarding performance of private equity real estate funds and liquidity management of REITs by introducing two new factors that are newly identified in the context of capital flows. First, by incorporating the role of heterogeneous institutional investors in private equity funds, I solve the existing puzzles in performance persistence of private equity real estate funds. The distinction between sophisticated and unsophisticated investors provides new insights into the inconclusive relation between fund growth and fund performance faced by prior studies. Second, by including an index of time-varying financing conditions that has not been specified and mostly neglected in prior studies of REIT liquidity management, this study presents a challenge to the long believed bridge loan hypothesis that REITs utilize credit lines first and then raise equities later to repay the use of credit lines. In the presence of time-varying financing conditions, REITs' liquidity management is revealed in the more complicated patterns.

The new findings have several implications for the investors participating in the private equity real estate markets. First, this study suggests that investors should keep an eye on the growth in fund size because limiting fund flows is a main driver for keeping performance persistence. The fund size needs to be considered as one of critical negotiation terms because the size growth, in general, is favorable to managers, while unfavorable to investors. Lucrative managers collect significant incentives through increasing fund size before delivering real returns to investors. Second, the findings imply that the return chasing behavior of investors in anticipation of performance persistence actually deteriorates the persistence in fund performance. The investors, who do not understand this mechanism, have the potential risks to misinterpret the performance persistence and simply place too much weight on past performance when they make investment decisions. As seen in the investments of unsophisticated investors that are highly responsive to the past returns, their investment patterns result in eliminating the performance persistence.

APPENDIX 1

Cash Savings Rate to Equity Issuance

The regression model is

$$\Delta Cash_{\mathrm{it}} = \alpha_i + \alpha_t + \beta_1 Unused\ Credit\ Line_{it\text{-}1} + \beta_2 \text{Common Equity Issuance}_{\mathrm{it}}$$

$$+ \beta_3 \text{Common Equity Issuance}_{\mathrm{it}}\text{*Financing Condition}_{\mathrm{t}} + \beta_4 Retained\ Cash_{it}$$

$$+ \beta_5 Preferred\ Eqity\ Issuance_{it} + \beta_6 Public\ Debt\ Issuance_{it} + \beta_7 Other_{it\text{-}1}$$

$$+ \beta_8 \Delta Size\ of\ Total\ Credt\ Line_{it\text{-}1} + \beta_9 Q_{it\text{-}1} + \beta_{10} Firm\ Size_{it} + \varepsilon_{\mathrm{it}}$$

	Δcash(t)				Δcash(t+1)			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Rating	Market Cap.	Int. Cov.	Composite 1	Rating	Market Cap.	Int. Cov.	Composite 1
Cash(t-1)	-0.307***	-0.288***	-0.362***	-0.311***	-0.575***	-0.552***	-0.628***	-0.579***
	(0.0451)	(0.0417)	(0.0954)	(0.0469)	(0.0394)	(0.0495)	(0.0530)	(0.0402)
Common Equity Issuance	0.193**	0.218***	0.208**	0.196**	0.0128	0.0214	0.0494	0.00928
	(0.0861)	(0.0788)	(0.0944)	(0.0849)	(0.0295)	(0.0313)	(0.0338)	(0.0286)
Common Equity Issuance*Financing Condition	0.283	0.309*	0.324	0.290	0.179**	0.120	0.0604	0.174**
	(0.200)	(0.182)	(0.205)	(0.197)	(0.0825)	(0.0788)	(0.0927)	(0.0776)
Ratined Cash	0.231***	0.229***	0.199***	0.213***	0.149*	0.0623	0.0685	0.0486
	(0.0609)	(0.0596)	(0.0654)	(0.0606)	(0.0760)	(0.0620)	(0.0647)	(0.0645)
Preferred Equity Issuance	0.134***	0.125***	0.182***	0.133***	0.0119	0.0285	0.0330	0.0200
	(0.0354)	(0.0346)	(0.0532)	(0.0373)	(0.0241)	(0.0266)	(0.0354)	(0.0275)
Public Debt Issuance	0.289*	0.256***	0.381***	0.413***	0.114*	0.0641	0.0969**	0.149**
	(0.156)	(0.0757)	(0.0994)	(0.112)	(0.0595)	(0.0415)	(0.0437)	(0.0674)
Other	0.133***	0.154***	0.122***	0.136***	0.0352***	0.0456**	0.0237***	0.0315***
	(0.0278)	(0.0268)	(0.0280)	(0.0262)	(0.0113)	(0.0178)	(0.00884)	(0.0118)
Q(t-1)	0.00934***	0.00325	-3.99e-05	0.00590	0.00569	-0.00456	0.00381	0.00274
	(0.00334)	(0.00423)	(0.00435)	(0.00361)	(0.00508)	(0.00793)	(0.00528)	(0.00554)
Firm Size	0.000960	0.000896	-0.00175	-0.000167	-0.00708**	-0.00861**	-0.00710**	-0.00813**
	(0.00222)	(0.00225)	(0.00170)	(0.00224)	(0.00326)	(0.00384)	(0.00279)	(0.00321)
Observations	3,132	3,087	3,094	3,095	3,124	3,082	3,092	3,090
R-squared	0.487	0.468	0.480	0.500	0.532	0.465	0.459	0.533
Number of Firms	97	111	137	116	97	111	137	116
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Quarter FE	YES	YES	YES	YES	YES	YES	YES	YES

Note: The dependent variables of Δcash(t) and Δcash(t+1) are the differences between cash at the end of quarters t, t+1 and cash at the end of the quarter t-1. The major independent variables are cash sources for cash savings, which include common equity issuance, retained cash, preferred equity issuance, public debt issuance, and cash from sales of assets (Other). The Tobin's Q is a market to book ratio which controls investment opportunities. Except Tobin's Q, all variables are normalized by the size of total asset at the beginning of quarter. The regression includes firm and quarter effects. Standard errors are clustered on both firm and quarter. R-squared reflect within-firm variations. Robust t-statistics are reported in the parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

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