REIT Crash Risk and Institutional Investors

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Abstract

This paper examines the relationship between the stock crash risk of REITs and different types of institutional investors. First, when we classify REIT institutional investors by their legal type, we find that the ownership of pension funds (bank trusts) is negatively (positively) related to REIT crash risk. In addition, the trading of investment companies, including mutual funds, has become positively related to REIT crash risk in recent years. Next, when we classify REIT institutional investors by their investment behavior, we find that REIT crash risk is positively related to the trading of transient institutional investors, which trade frequently to maximize short-term gains. Moreover, the adverse impact of transient investors on REIT crash risk has worsened recently. These findings highlight the heterogeneous impacts of different types of institutional investors on REIT crash risk, which has important implications for REIT market participants and policymakers.

Key Words: REITs, Stock Crash Risk, Institutional Investor

JEL Classification G10 G14

Introduction

Real Estate Investment Trusts (REITs) have developed into an important segment of the U.S. stock market. The combined market capitalization of public REITs has soared from less than $8 billion in 1990 to over $700 billion in 2014.[1] Meanwhile, S&P Dow Jones Indices has included over 80 REITs into its broad equity market indexes.[2] Accompanied with the rapid growth though are unprecedented levels of volatility in the REIT market, which stimulates strong research interest in the changing risk characteristics of REITs. While the extant literature focuses on the standard deviation of REIT returns, we instead examine the crash risk, the third moment of REIT return distributions.

Stock crashes not only greatly reduce the wealth of investors, but also substantially affect their mental health.[3] There is a growing literature that investigates the crash risk of regular stocks, especially after the financial crisis.[4] However, little research has been conducted on REIT crash risk. We attempt to fill this void by examining the firm-specific determinants of REIT crash risk, with a particular focus on institutional investors.

We consider the connection between REIT crash risk and institutional investors for the following reasons. The institutional ownership of U.S. public equity REITs has increased from 14.14% in 1990 to 75.19% in 2011.[5] During the same period, there is an upward trend in REIT crash risk. Employing three measures of stock crash risk, we find the average REIT crash risk

[1] The market capitalization data are from www.REIT.com, the website of the National Association of Real Estate Investment Trusts (NAREIT).
[2] For details, please visit http://www.REIT.com/investing/investing-tools/REITs-sp-indexes.
[3] McInerney, Mellor, and Nicholas (2013) show that the stock market crash in 2008 increased investors' feelings of depression and use of antidepressant drugs.
[4] For regular stocks, the extant literature finds that stock crash risk is related to accounting accruals, tax avoidance, executive compensation, and institutional investors. For details, please see Hutton, Marcus, and Tehranian (2009), Kim, Li, and Zhang (2011a), Kim, Li, and Zhang (2011b), An and Zhang (2013), and Callen and Fang (2013).
[5] We calculate the institutional ownership of public equity REITs based on the Thomson Financial Institutional Holdings (13F) database.

started increasing in the late 1990s and peaked in 2008 during the financial crisis.[6] The development during the last two decades provides a unique setting to examine the impact of changing ownership structure on REIT crash risk.

Furthermore, the sharp increase of institutional ownership in REITs has stirred considerable debate about the role played by institutional investors in the REIT sector. On the one hand, many critics are wary of the frequent trading and short-termism of institutional investors. As Bogle (2009), the founder of Vanguard Group, states, "The predominant focus of institutional investment strategy turned from the wisdom of long-term investing, based on the enduring creation of intrinsic corporate values, to the folly of short-term speculation, focused on the ephemeral prices of corporate stocks." The alleged short-term speculation of institutional investors could increase stock price volatility and even result in crashes of REIT stocks. Moreover, the short-term focus of institutional investors creates pressure for REIT managers to behave myopically. Sensitive to stock price, REIT managers are more likely to conceal adverse information if institutional investors will dump their stocks at the first sign of declining performance. According to the theoretical model of Jin and Myers (2006), when the accumulated bad news finally crosses a tipping point, all the bad news becomes publicly available, which results in a stock price crash. Therefore, this short-term view about institutional investors predicts that institutional ownership should be positively correlated to REIT crash risk.

On the other hand, many regulators and academics consider institutional monitoring as a governance solution to the agency problem in public companies, including listed REITs. More sophisticated than retail investors, institutional investors have stronger incentives to monitor their holding REITs. Moreover, the large increase in ownership has placed institutional investors into a controlling position to influence REIT managers. In the recent REIT literature, Feng et al.

[6] See Figure 1 for details.

(2010) find that institutional investors act as monitors by influencing the executive compensation of REIT managers. Chung, Fung, and Hung (2012) show that certain institutional investors improve corporate governance and operational efficiency of REITs. To the extent that institutional investors monitor their holding REITs, active shareholder monitoring should reduce the bad news hoarding of REITs managers, which leads to fewer REIT stock crashes, according to Jin and Myers (2006). Given the opposing views about institutional investors, the relationship between REIT crash risk and institutional investors is ultimately an empirical question. A clear understanding of this relationship could shed light on the role played by institutional investors in changing the risk characteristics of REITs.

Based on detailed ownership data from the Thomson Financial Institutional Holdings database, we find that the stock crash risk of equity REITs is not significantly related to their *total* institutional ownership from fiscal year 1994 to 2011. The absence of evidence that institutional investors, as a whole, relates to REIT crash risk, though doesn't preclude the possibility that predominant ownership by certain types of institutions affects REIT stock crash risk. It is important to note that institutional investors are not a homogeneous group and they differ greatly in fiduciary duties, regulatory restrictions, investment behaviors, and competitive pressures. Therefore, we decompose institutional investors based on their legal type into four major groups: pension funds, investment companies, bank trust, and insurance companies.[7] We find a significant negative relationship between pension fund ownership and REIT crash risk. Moreover, the negative relationship is driven by the *holding* of pension funds, rather than their *trading*. A one-standard-deviation increase in pension fund ownership will reduce the crash risk

[7] Total institutional ownership also includes university and foundation endowments, and miscellaneous institutions. Because REIT ownership by endowments is relatively small, we don't report them separately in the paper. Similarly, we don't report miscellaneous institutions explicitly since their exact type is unknown.

of the sample REIT by 4.5%.[8] Pension funds provide patient capital and effective governance for their holding REITs. The long investment horizon of pension funds gives them both a stronger incentive and a better ability to monitor their portfolio REITs. To the extent pension funds monitor their holding REITs, the negative relationship between pension fund ownership and REIT crash risk is consistent with the monitoring view about institutional investors.

In contrast, we find REITs with larger bank ownership are more likely to crash. A one-standard-deviation increase in bank trust ownership will increase the crash risk of the sample REIT by 5.4%.[9] According to Brickley, Lease, and Smith (1988), banks are grey institutional investors which seek business relationships with their portfolio firms. REITs are frequent customers of banks because they rely heavily on banks for external financing due to their financial constraints.[10] The potential conflict of interests makes it more difficult for banks to effectively monitor REIT managers. Compromised shareholder monitoring makes it easier for REIT managers to hide bad news, which increases the crash risk of REIT stocks.

Governed by less strict fiduciary laws, investment companies (including mutual funds) adopt more aggressive investment strategies by emphasizing capital appreciation. They trade more frequently in an attempt to maximize returns. Furthermore, investment companies encounter much more churn in their funding sources than pension funds, which results in trading that is more sensitive to the short-term performance of portfolio firms (Bushee (2004)). Therefore, based on the short-term view, we expect investment companies to be positively related to REIT crash risk. Indeed, we find a significantly positive relationship between REIT crash risk and the *trading* of investment companies from fiscal year 2000 to 2011. On the other hand, the *holding* of the investment companies is not significantly correlated to REIT crash risk.

[8] The economic significance is calculated based on the regression result reported in column 1 of Table 5.
[9] The economic significance is calculated based on the regression result reported in column 3 of Table 5.
[10] See Hardin and Wu (2010) in the context of REITs.

These results suggest that it is the trading, not holding of investment companies that leads to higher REIT crash risk.

Besides classification by legal type, we follow the methodology of Bushee (1998) to classify institutional investors into three categories based on their investment behavior: (1) transient institutions, which exhibit high portfolio turnover and own small stakes in individual firms, (2) dedicated institutional investors, which take large positions in portfolio companies for a long time, and (3) quasi-indexers, which trade infrequently but own small stakes. Transient institutional investors trade aggressively to maximize short-term gains. Due to their short-term focus and highly diversified holdings, transient institutions have little incentive to monitor REIT managers. For the full sample period, we find that trading of transient institutional investors is positively related to REIT crash risk, providing evidence of short-termism of transient institutions. Moreover, the short-termism of transient institutions has a worsening trend as evidenced by a more pronounced adverse impact of transient institutional trading on REIT crash risk in recent years.

Finally, we compare the results of REITs with those of regular corporations. We find several differences in the regression results between REITs and matched non-REITs.[11] While total institutional ownership is not significantly related to the crash risk of REITs, but it is positively related to that of non-REITs. Univariate analyses show that the investor base of non-REITs is more short-term orientated than that of REITs. Compared to REITs, non-REITs have higher ownership by transient institutions, which significantly increase their crash risk. Moreover, when we decompose the total institutional ownership by legal type, we find the ownership of pension funds (investment companies) is lower (higher) for non-REITs than REITs.

[11] For each REIT-year observation in our sample, we select a matched non-REIT firm with the nearest market capitalization in the fiscal year from Compustat. We thank the referee for making this suggestion.

While pension funds are associated with lower crash risk for both REITs and non-REITs, the regression results regarding investment companies are different. Specifically, investment companies significantly increase the crash risk of non-REITs, but not REITs for the full sample period. Investment companies include many short-term traders, such as hedge funds and broker/dealers with high-frequency trading strategies. REITs were not the primary trading targets of these institutions during the earlier period when the REIT sector was relatively small and less liquid. However, with exponential growth in the new era, REITs have become more integrated into the broad stock market. As reported earlier, the trading of investment companies has become positively related to the crash risk of REITs in recent years. Although less severe during the full sample period, the adverse impact of short-term institutions on REIT crash risk is worsening over time.

The findings of this paper have important implications for REIT managers, investors, and policy makers. REIT stock crashes not only create large losses for market participants, but also cause substantial damages to the REITs. A better understanding of these tail events improves portfolio risk management. For example, value at risk (VaR), a widely-used risk management application, depends on skewness and crash risk. Similarly, it is essential for REIT managers to understand the determinants of crash risk in order to avoid these extremely negative events, which cause substantial damage to the REITs, such as higher financing cost and even delisting.

REIT regulators have generally encouraged the flow of institutional capital into the REIT sector. The Omnibus Budget Reconciliation Act of 1993 relaxed the ownership qualification of REITs, leading to an industry-wide targeting of institutional investors. Downs (1998) finds that targeting institutional investors, particularly pension funds, creates significant value in the REIT industry. However, the findings of this paper reveal that the strategy of targeting institutional

investors is a double-edged sword. While the industry benefits from targeting certain institutions, such as pension funds, the excessive trading of short-term focused institutional investors can expose REITs to significant crash risk. Policymakers and REIT managers should exercise caution when targeting institutional investors.

Our study contributes to a growing literature on REIT institutional investors.[12] Conventionally, REIT institutional investors are perceived as long-term, passive owners. However, Devos et al. (2013) find that institutional investors actively managed their REIT holdings during the recent market downturn and display a "flight to quality" based on market conditions. Their findings challenge the traditional view about REIT institutional investors and raise questions about the consequences of institutional trading on REIT stocks. We extend this line of research by providing new evidence on the connection between REIT stock crash risk and institutional investors. As noted by Devos et al. (2013), the literature on the heterogeneity of REIT institutional investors is very sparse as most studies treat them as a homogeneous group. Our results highlight the importance of disaggregating institutional investors and the heterogeneous impacts of different institution types on REIT crash risk. This paper is also one of the first to classify institutional investors based on their investment behavior in the context of REITs.

[12] Here is a partial list of earlier studies on REIT institutional investors. Ling and Ryngaert (1997) offer evidence that the participation of institutional investors changes the dynamics of the IPO market of REITs. Chan, Leung, and Wang (1998) document a new trend in institutional investors' preference for REITs. Crain, Cudd, and Brown (2000) find that institutional investors change the pricing structure of REITs. Ciochetti, Craft, and Shilling (2002) find that institutional investors generally prefer larger, more liquid REIT stocks. Ghosh and Sirmans (2003) find that institutional investors are not effective monitors. Chan, Leung, and Wang (2005) find that the Monday effect of REIT stocks disappears after institutional ownership increases. Hartzell, Sun, and Titman (2006) show institutional investors improve the investments decisions of REITs, which can be explained by institutional monitoring. Devos et al. (2013) examine the REIT ownership of institutional investors during the financial crisis.

The remainder of this paper is organized as following. Section 2 describes the sample and variables. Section 3 discusses the empirical design and findings, and Section 4 concludes the paper.

Sample and Variable Construction

Sample

We begin with all publicly traded equity REITs in the FTSE NAREIT All REITs Index as identified by NAREIT from 1993 to 2012.[13] We obtain stock price data from the Center for Research in Security Prices (CRSP), and accounting data from Compustat.[14] The institutional ownership data are from the Thomson Financial Institutional Holdings (13F) database. We exclude observations when the REIT traded for less than 26 weeks over a fiscal year to avoid the REITs that went public, were delisted, or experienced trading halts. The final sample contains 2,166 REIT-year observations, which have all the required regression variables.

Institutional Ownership

SEC Rule 13f requires that all institutional investors with over $100 million in equity report their holdings. For each REIT in a sample year, we first calculate the total institutional holdings by adding the shares owned by all institutional investors of that REIT based on their 13f form filings in the Thomson Financial Institutional Holdings database. We then divide the total institutional holdings by the REIT's total number of shares outstanding obtained from CRSP. This is the first

[13] We thank McKay Price for providing the REIT list. For details, please see Feng, Price, and Sirmans (2011).
[14] Since the accounting data are based on fiscal year, the sample period begins in fiscal year 1994 and ends in fiscal year 2011.

measure of institutional ownership, *IO*. Besides *IO*, we calculate three alternative proxies for institutional ownership. *IO_TOP1* is the proportion of ownership by the REIT's largest institutional investor. *IO_TOP5* is the proportion of ownership by the top five institutional investors of the REIT, and *IO_BLOCK* is the proportion of shares owned by blockholders with more than 5% of shares outstanding.

Classifying institutional investors by legal type

A common way to classify institutional investors is based on legal type. We group institutions into four major legal types: pension funds, investment companies, bank trust, and insurance companies.[15] We denote the ownership of the pension funds, investment companies, bank trusts, and insurance companies in the REIT by *IO_PEN*, *IO_INV*, *IO_BNK* and *IO_INS*, respectively.

Classifying institutional investors by investment behavior

Another way to classify institutional investors is based on their observed investment and trading behavior. Following the methodology of Bushee (1998), we classify institutional investors into three types: transient, dedicated and quasi-indexer investors.[16] Transient investors exhibit high portfolio turnover and own small stakes in portfolio firms. In contrast, dedicated investors take large stakes for a long time. Finally, quasi-indexer institutions trade infrequently

[15] Because the ownership by university and foundation endowments is relatively small, we don't report them in the paper. In addition, we don't report miscellaneous institutions since their exact type is unknown.

[16] The classification is based on institutional investors' ownership stability and stake size. Ownership stability is measured by quarterly portfolio turnover and the fraction of the institution's stocks that are held for more than two years. Stake size is measured by the average percentage ownership, the fraction of block holdings, the average dollar investment, and a Herfindahl index of ownership concentration. We thank Brian Bushee for the classification data.

but own small stakes in portfolio firms. We denote the ownership of the transient, dedicated and quasi-indexer institutions in the REIT by *IO_TRA*, *IO_DED* and *IO_IDX*, respectively.

Measuring Crash Risk

We construct three measures of firm-specific stock crash risk following the literature.[17] First, we run the expanded market model regression in Equation (1) for REIT *i* in fiscal year *t*.[18]

$$r_{i,w} = \alpha_i + \beta_i \cdot r_{m,w} + \gamma_i \cdot r_{k,w} + \varepsilon_{i,w} \qquad (1)$$

where $r_{i,w}$ is the return of REIT *i* in week *w*, $r_{m,w}$ is the CRSP value-weighted market return in week *w*, and $r_{k,w}$ is the value-weighted return of the equity REIT industry in week *w*. The REIT in question is excluded when calculating the REIT industry return to prevent the size effect of large REITs. We use weekly returns to avoid the problem of thinly traded REITs. To avoid REITs that went public, were delisted, or experienced trading halts, we follow the literature and exclude REITs whose shares trade for less than 26 weeks over a fiscal year.

We then construct the three firm-specific crash risk measures based on the regression residuals from Equation (1). Because the return residuals are highly skewed, we log transform them to a roughly symmetric distribution. Following Hutton, Marcus, and Tehranian (2009), the firm-specific weekly return is equal to the natural log of one plus the regression residual from

[17] For the measures of firm-specific stock crash risk, please see Jin and Myers (2006), Hutton, Marcus, and Tehranian (2009), An, Cook, and Zumpano (2011), Kim, Li, and Zhang (2011b), Kim, Li, and Zhang (2011a), and An and Zhang (2013).

[18] We obtain quantitatively similar results when we include property returns, when we include lead and lag returns, and when we use the Fama-French three-factor model.

Equation (1).

The first measure of crash risk is *NCSKEW*, the negative conditional skewness. We follow the literature and calculate *NCSKEW* as the negative third central moment of firm-specific weekly returns divided by the cubed standard deviation of firm-specific weekly returns. Specifically, *NCSKEW* for REIT *i* in fiscal year *t* is:

$$NCSKEW_{i,t} = -\left[n(n-1)^{3/2}\sum_{\tau=1}^{n}\left(W_{i,\tau,t}-\bar{W}_{i,t}\right)^3\right]\Big/\left[(n-1)(n-2)\left(\sum_{\tau=1}^{n}\left(W_{i,\tau,t}-\bar{W}_{i,t}\right)^2\right)^{3/2}\right] \quad (2)$$

where $W_{i,t}$ is the firm-specific weekly return. $\bar{W}_{i,t}$ is the average firm-specific weekly return in fiscal year *t*, and *n* is the number of observations in fiscal year *t*. Scaling the raw central third moment by the cubed standard deviation allows for comparison across returns with different variances, a standard normalization employed for skewness in statistics. The negative sign in front of the skewness ensures that a larger *NCSKEW* corresponds to higher crash risk, i.e., a more negative-skewed stock return distribution.

The second measure of crash risk is *DUVOL*, down-to-up volatility. Following Chen, Hong, and Stein (2001), the up (down) weeks refers to any week when the firm-specific weekly returns are above (below) its annual mean. For each REIT year, we calculate the standard deviations of firm-specific weekly returns during both the up and down weeks. *DUVOL* is the log of the ratio of the standard deviation on down weeks to the standard deviation on up weeks. The convention is that a higher value of *DUVOL* parallels a more left-skewed distribution.

The third measure of crash risk is *COUNT*. A crash (jump) occurs when the firm-specific weekly return is 3.09 standard deviations below (above) its mean over the fiscal year. We follow

Hutton, Marcus, and Tehranian (2009) and choose 3.09 to generate 0.1% in the normal distribution. *COUNT* is the number of crashes minus the number of jumps over the fiscal year. Following Jin and Myers (2006), we subtract extreme positive residual returns from extreme negative returns to prevent *COUNT* from simply picking up volatility.

Summary Statistics

Figure 1 plots the average annual crash risk of REITs during the sample period. The three measures of REIT crash risk have a clear upward trend since the late 1990s. They increased dramatically in 2007 and peaked in 2008, when REITs experienced extensive carnage during the financial crisis. As the recovery began, the REIT crash risk measures declined quickly but they started picking up again towards the end of the sample period.

[Insert Figure 1 about here]

Table 1 provides summary statistics. Residual returns from Equation (1) on average are positively skewed. As a result, the sample means of *NCSKEW* and *DUVOL* are negative, as expected with positively skewed returns. The sample mean of *COUNT* is positive as extreme negative residual returns generally outnumber and outweigh extreme positive residual returns in the sample. The three crash risk measures are on average larger than those of non-REIT Compustat firms reported by An and Zhang (2013) and Callen and Fang (2013).[19]

[19] We compare the crash risk between REITs and non-REITs in more details in section 3.5.

[Insert Table 1 about here]

Institutional investors have substantial interests in REITs and the average aggregate institutional ownership is 51.9% during the sample period, slightly less than half of which is accounted for by the five largest institutional owners. On average, the institutional ownership of REITs is higher than that of Compustat firms as reported by An and Zhang (2013) and Callen and Fang (2013). The institutional ownership reported in the REIT literature varies due to different sample periods and datasets. For example, the mean institutional ownership of U.S. public equity REITs is 49% from 1994 to 2004 in Wiley and Zumpano (2009), 45% from 1995 to 2004 in Hartzell, Sun, and Titman (2006), 51% from 2004 to 2010 in Devos et al. (2013), and 49% from 1995 to 2008 in Hartzell, Sun, and Titman (2014). Overall, the institutional ownership data reported in this study are in line with the REIT literature given the upward trend of REIT institutional ownership over time.

Among different legal types of institutions, investment companies have the largest REIT ownership with average holding at 34.8%, followed by bank trusts at 8.3%, insurance companies at 3.7%, and pension funds at 2.7%. The average holdings of the transient, dedicated and quasi-indexer institutional investors are 9.9%, 7%, and 34.3%, respectively. [20]

The summary statistics of the control variables are overall consistent with the REIT literature. For example, return on assets is on average 2.5%, comparable to 2.7% reported by Hardin and Hill (2008). Firm size, measured by the natural log of market capitalization, is on average 6.12, slightly higher than 5.88 reported by An, Hardin, and Wu (2012). The difference is mainly due to different sample periods. The mean leverage is 48%, close to 46% reported by Giambona, Harding, and Sirmans (2008) and An, Cook, and Zumpano (2011).

[20] We compare the difference in institutional ownership between REITs and non-REITs in more details in section 3.5.

[Insert Table 2 about here]

Table 2 shows the distribution of the sample over time. The number of U.S. public equity REITs peaked in the late 1990s, followed by a decade-long decline. More recently, the declining trend has been reversed after the financial crisis. The institutional ownership of equity REITs has increased from 34% in 1994 to 75% in 2011.

[Insert Table 3 about here]

Table 3 shows the distribution of the sample by property type. Among the eight property types, retail has the largest portion of the sample, followed by residential and office. The institutional ownership varies among different property types. Office REITs have the highest institutional ownership at 62%; Self-storage REITs have the lowest institutional ownership at 36%. In terms of stock crash risk, hotel REITs have the highest crash risk; diversified REITs have the lowest crash risk.

Empirical Design and Results

We follow the literature and test the relationship between institutional investors and the stock crash risk of REITs based on the model below:

$$\begin{aligned} CRASH_{i,t} = {} & \alpha_t + \beta_1 \cdot IO_{i,t-1} + \beta_2 \cdot DTURN_{i,t-1} + \beta_3 \cdot NCSKEW_{i,t-1} \\ & + \beta_4 \cdot SIGMA_{i,t-1} + \beta_5 \cdot RET_{i,t-1} + \beta_6 \cdot ROA_{i,t} + \beta_7 \cdot SIZE_{i,t-1} \\ & + \beta_8 \cdot MTB_{i,t-1} + \beta_9 \cdot LEV_{i,t-1} + \varepsilon_{i,t} \end{aligned} \qquad (3)$$

The parameter α_t denotes a different intercept for each fiscal year. In this equation, the dependent variable $CRASH_{i,t}$ is a measure of crash risk for REIT *i* in fiscal year *t*. As described before, we have three such measures: *NCSKEW*, *DUVOL*, and *COUNT*. The variable of interest is $IO_{i, t-1}$, the institutional ownership for REIT *i* in fiscal year *t*-1.

We also follow the literature by including a set of control variables: *DTURN* is the detrended turnover, calculated as the difference between average monthly turnover over fiscal year *t*-1 and the prior fiscal year's average monthly turnover; *NCSKEW* is the lagged value of *NCSKEW*; *RET* is the average firm-specific weekly return over the last fiscal year; *ROA* is the contemporaneous income before extraordinary items divided by the book value of total assets;[21] *SIZE* is the natural log of the REIT's market value of equity at the end of the last fiscal year; *MTB* is the ratio of the market value of equity to the book value of equity at the end of the last fiscal year; *LEV* is the book value of all liabilities scaled by total assets at the end of the last fiscal year; *SIGMA* is the standard deviation of the firm-specific weekly returns over the last fiscal year.

Aggregate Institutional Ownership

We first employ Equation (3) to examine the relationship between REIT crash risk and the aggregate institutional ownership. Besides *IO*, the total institutional ownership, we also regress crash risk against *IO_TOP1*, the ownership by the REIT's largest institutional investor; *IO_TOP5*, the ownership by the top five institutional investors, and *IO_BLOCK*, the ownership by blockholders. Table 4 reports the regression results. As discussed in Section 2.2, we have

[21] When we replace ROA by funds from operations (FFO) scaled by total assets as of the previous year-end, our main results remain similar but the sample size is reduced due to missing FFO data.

three measures of crash risk. The dependent variables are *NCSKEW* in columns 1-4, *DUVOL* in columns 5-8, and *COUNT* in columns 9-12. Across the three crash risk measures, none of the four institutional ownership measures are statistically significant at conventional levels. Therefore, when treated as a homogenous group, institutional investors do not seem to relate to the crash risk of REITs, which is not surprising given the heterogeneity of institutional investors in their monitoring and investment behaviors.

[Insert Table 4 about here]

Next, we discuss the results of the control variables. Consistent with Hutton, Marcus, and Tehranian (2009), Kim, Li, and Zhang (2011a), Kim, Li, and Zhang (2011b), and An and Zhang (2013), the estimated coefficient on *ROA* is negative, suggesting that REITs with good operating performance are less likely to crash. However, it is only significant at the 10% level in column 8 when *DUVOL* is the dependent variable. The estimated coefficients on the lagged *NCSKEW* are significantly positive at the 10% level in columns 1-4, where the dependent variable is *NCSKEW*. This result is consistent with Chen, Hong, and Stein (2001), who find that skewness is persistent. Consistent with prior studies, the estimated coefficient on *SIZE* is significantly positive. In column 1, the estimated coefficient of *SIZE* is .033. Given the standard deviation of *SIZE* in our sample is 1.609, a one-standard-deviation increase in firm size will increase the crash risk of the sample REIT by 5.3%. However, the estimated coefficient on *DTURN*, a proxy for investor belief heterogeneity, is significantly negative, different from the prior studies, which typically exclude REITs from the sample.

Institutional Investors Classified By Legal Type

Since institutional investors are not a homogeneous group, in this section we divide them into four major groups based on legal type: pension funds, investment companies, bank trust, and insurance companies. Different types of institutions are subject to different fiduciary duties, regulatory restrictions, investment objectives, and competitive pressures. Therefore, their investment practices may differ significantly across legal types.

Holding levels of institutional investors classified by legal type

We first test the relationship between REIT crash risk and the *holding levels* of different legal types of institutional investors. Table 5 reports the regression results.

[Insert Table 5 about here]

The estimated coefficients on pension fund ownership, *IO_PEN*, are significantly negative at the 1% level across the three crash risk measures, which suggests that REITs with higher pension fund ownership are less likely to crash. In column 1, the estimated coefficient of *IO_PEN* is -1.377. Given the standard deviation of *IO_PEN* in our sample is .033, a one-standard-deviation increase in pension fund ownership will reduce the crash risk of the sample REIT by 4.5%. Pension funds provide patient capital and effective governance for their holding REITs. The investment objective of pension funds is to provide long-term stable growth of retirement income. Their sources of funding and liquidity needs are more predictable than other institutional investors, such as mutual funds, which encounter more volatile capital inflows and

outflows. As a result, pension funds are more concerned about creating long-term value, rather than maximizing short-term trading gains. Insulated from excessive short-term pressure, REIT managers can focus on the long-term strategies, instead of earnings management to meet Wall Street's quarterly forecasts. Moreover, pension funds have become a large force in shareholder activism.[22] Given the long-term nature of their investment, pension funds have both a stronger incentive and a better ability to monitor the portfolio REITs since they stay with the REIT longer and know the management better.

The negative relationship between REIT crash risk and pension ownership is consistent with the agency explanation of stock price crash. According to the theoretical model of Jin and Myers (2006), stock price crashes when accumulated negative firm-specific information suddenly becomes publicly available. To avoid negative consequences, firm managers hide the bad news when the firm's cash flow is lower than investors expect. However, they will give up trying to conceal the information when the accumulated bad news finally crosses a tipping point. Then all the bad news is released at once, which results in a stock price crash. To the extent that pension funds monitor their holding REITs, active shareholder monitoring should reduce the bad news hoarding of REITs managers, which leads to fewer REIT stock crashes.

In contrast to pension funds, the estimated coefficients on bank trust ownership, *IO_BNK*, are significantly positive across the three measures of crash risk.[23] In column 3, the estimated coefficient of *IO_BNK* is .918. Given the standard deviation of *IO_BNK* in our sample is .059, a one-standard-deviation increase in bank trust ownership will increase the crash risk of the sample

[22] According to Gillan and Starks (2007), the formation of the Council of Institutional Investors (CII) by pension funds in 1985 signifies the beginnings of shareholder activism by institutional investors. The goal of CII is "strong governance standards at public companies and strong shareholder rights". Consisting of more than 125 public, labor, and corporate pension funds, CII pools the resources of its members and "use their proxy votes, shareowner resolutions, pressure on regulators, discussions with companies and litigation where necessary to effect change."

[23] The estimated coefficients of *IO_BNK* are significantly positive at the 5% level in columns 3 and 7, and at the 10% level in column 12.

REIT by 5.4%. Banks manage clients' equity investment through their trust departments, which are governed by the most stringent fiduciary laws among various legal types of institutional investors. Bushee (2001) finds that bank trusts exhibit strong preference for near-term earnings over long-term value of their portfolio firms, which he attributes to the higher fiduciary pressure faced by bank trusts. In other words, bank trusts prefer firms delivering strong earnings in the near future to convince clients of their equity investment. However, the short-term focus of bank trusts can exacerbate myopic behaviors of REIT managers, such as bad news hoarding, which eventually leads to stock price crashes. Moreover, the potential conflict of interests makes it more difficult for banks to effectively monitor REIT managers. REITs are frequent customers for banks because of their financial constraints and heavy reliance on banks for external financing. A bank trust is less likely to oppose REIT managers if the bank is actively seeking a business relationship with the REIT. Compromised shareholder monitoring makes it easier for REIT managers to hide bad news, which leads to REIT stock crashes once the accumulated bad news is finally released after reaching the tipping point (Jin and Myers (2006)).

As for investment companies, their estimated coefficients are all positive, suggesting a positive relationship between REIT crash risk and investment companies. However, the *t* statistics are not significant at conventional levels. The results of insurance companies are similar to those of investment companies.

Trading of institutional investors classified by legal type

So far, the results are about the *holding levels* of institutional investors. Next, we test if the *trading* of institutional investors is related to REIT crash risk. Specifically, we break down institutional ownership in year *t*-1 into two components: the change of ownership in year *t* -1 and

the ownership in year *t*-2. The change of institutional ownership is a proxy for institutional trading.

[Insert Table 6 about here]

Table 6 reports the regression results for different legal types of institutional investors. Across the three crash risk measures, we find both the holding and trading of pension funds are negatively related to REIT crash risk. However, pension fund *holding* is much more significant than pension fund *trading* statistically. The robust *t* statistics of *ΔIO_PEN* (*IO_PEN*), the proxy for pension trading (holding) are -3.449 (-1.689) in column 1, -3.596 (-1.665) in column 5, and -4.040 (-0.597) in column 9. Therefore, the negative relationship between REIT crash risk and pension funds is primarily driven by the holding of pension funds, not their trading. This result is as expected since pension funds tend to be patient investors, which hold stocks for a long time, rather than trade them often.

As for investment companies, we find both the holding and trading of investment companies are positively related to REIT crash risk. However, they are not statistically significant for the full sample period.[24] Next, we discuss the results regarding bank trusts. While the estimated coefficients on *ΔIO_BNK*, the proxy for bank trading, are not significant at conventional levels, those on *IO_BNK*, the lagged bank holding, are significant at the 5% level across all three crash risk measures. Therefore, the positive relationship between REIT crash risk and bank trusts is primarily driven by the holding of bank trusts, not their trading, a finding

[24] As we will show later in Section 3.4, the dynamic relationship between investment companies and REIT crash risk has changed in recent years.

similar to pension funds. Lastly, neither the trading nor the holding of insurance companies is significantly related to the crash risk of REIT stocks.

Institutional Investors Classified by Investment Behavior

Based on investment behavior, in this section we classify institutional investors into transient, dedicated, and quasi-indexer institutions.

Holding levels of institutional investors classified by investment behavior

We first investigate the relationship between REIT crash risk and the *holding levels* of transient, dedicated, and quasi-indexer institutions. Table 7 reports the regression results.

[Insert Table 7 about here]

The estimated coefficients of *IO_TRA*, *IO_DED*, and *IO_QIX* are positive, negative, and positive, respectively. The signs of the three types of institutional investors are all consistent with the monitoring view about institutional investors. However, none of the *t* statistics of the three types of investors are significant at conventional levels.

Trading of institutional investors classified by investment behavior

In this section, we examine the trading of institutional investors with different investment behaviors. Although REIT crash risk is not significantly related to the *holding levels* of transient,

dedicated, and quasi-indexer institutions, we find that the *trading* of transient institutional investors is significantly related to REIT crash risk.

[Insert Table 8 about here]

As Table 8 shows, the estimated coefficients on *ΔIO_TRA*, the transient institutional trading, are 0.895 with a *t* statistic of 1.867 in column 1, 0.173 with a *t* statistic of 1.708 in column 4, and 0.386 with a *t* statistic of 1.649 in column 7. Therefore, there is some evidence that REIT crash risk is positively related to the trading of transient institutional investors. On the other hand, *IO_TRA*, the lagged transient institutional ownership, remain insignificant. Because transient institutions trade aggressively to maximize short-term gains, the evidence suggests their excessive trading contributes to the crash risk of REITs. Moreover, the adverse impact of transient institutional trading has worsened in more recent years, which we will show below.

As for the dedicated institutional investors, both their holding and trading are negatively related to the crash risk of REITs, which are consistent with the monitoring view about dedicated institutions. However, none of the *t* statistics are significant at conventional levels. Similarly, neither the holding nor the trading of quasi-indexers is significantly related to the crash risk of REITs.

REIT Crash Risk and Institutional Investors in the 21st Century

The results so far are based on the full sample period, which begins in 1994. However, the first decade of the 21st century witnesses two major stock market crashes, which makes it a unique

window to study crash risk. Another interesting development beginning at the turn of this century is the adoption of REITs into broad S&P equity indexes, which makes REITs as a sector more appealing to institutional investors.[25] In this section we focus on the subsample period from 2000 to 2011 to explore the dynamic relationship between REIT crash risk and institutional investors.

We first classify institutional investors by legal type and then by investment behaviors. Overall, the subsample results of institutional *holding* remain similar to the whole sample results, whereas institutional *trading* results have some notable changes during the more recent sample period.[26]

[Insert Table 9 about here]

First, we discuss the results based on the legal type of institutional investors. Recall for the full sample period, investment companies are not significantly related to REIT crash risk. However, for the subsample period, we find the trading of investment companies is significantly related to REIT crash risk. As Table 9 reports, the estimated coefficients (*t* statistics) of *ΔIO_INV*, the proxy for investment company trading, are 0.655 (1.996) in column 2, 0.312 (2.100) in column 6, and 0.100 (1.653) in column 10, respectively. The positive relationship between the trading of investment companies and REIT crash risk is consistent with the short-term view about investment companies. Compared to other types of institutional investors, investment companies (including mutual funds) are governed by less strict fiduciary laws. They

[25] Ambrose, Lee, and Peek (2007) examine the return comovement between REITs and general stocks after REITs join S&P indexes, and they conclude that REIT diversification power for investors has declined after the inclusion of many REITs into the broad stock indexes.
[26] The estimated coefficient on bank trust holding becomes less significant statistically in the subsample period.

typically adopt more aggressive investment strategies and trade more frequently in an attempt to maximize returns. Moreover, investment companies encounter much more churn in their funding sources than pension funds, which results in trading that is more sensitive to the short-term performance of portfolio firms (Bushee (2004)). The results suggest that the short-termism of investment companies has worsened in more recent years, which echoes Bogle (2009)'s criticism that the investment strategy of the mutual fund industry has been based increasingly on short-term speculation.

In contrast to the full sample results, the estimated coefficients on bank trust holding are no longer statistically significant after 2000, which suggests that bank trusts have a more muted impact on REIT crash risk during the subsample period. Except for these two differences, other subsample results are similar to the full sample results. For instance, the estimated coefficients on pension fund ownership remain significantly negative in the subsample period, similar to the full sample results.

[Insert Table 10 about here]

Next, we classify institutional investors by their investment behaviors. Table 10 reports the subsample estimation results. Compared to the full sample results, the adverse impact of transient institutional trading on REIT crash risk has become more pronounced in recent years. Both the magnitude and statistical significance of transient institutional trading are larger than those reported in Table 8 for the full sample. This is a warning sign for the REIT sector. If this trend continues, the short-termism of transient institutions could lead to more REIT stock crashes down the road.

Differences between REITs and Non-REITs

So far, all the reported results are for REITs. We now compare the REIT results to those of regular Compustat firms. For each REIT-year observation in our sample, we select a matched non-REIT firm with the nearest market capitalization in the fiscal year from Compustat. Table 11 compares the crash risk of REITs and non-REITs. Out of the three crash risk measures, *NCSKEW* and *DUVOL* of REITs are significantly (at the 10% level) higher than those of non-REITs over the full sample period. However, this result is driven by more recent sample period, particularly the financial crisis, when REITs exhibit significantly higher crash risk. There were no significant differences in crash risk between REITs and matched non-REITs before the financial crisis.[27]

[Insert Table 11 about here]

We find noteworthy differences when comparing the regression results of REITs and non-REITs. Table 12 summarizes the differences with the non-REIT results reported in Panel A and the corresponding REIT results shown in Panel B. An important difference is about *IO*, the total institutional ownership. While the estimated coefficient of *IO* is significantly positive for non-REITs, it is not significant for REITs. Why institutional investors, as a whole, significantly increase the crash risk of regular firms, but not REITs?

[Insert Table 12 about here]

[27] Results are not tabulated to save space, but available upon request.

To answer this question, we first compare the institutional ownership between REITs and non-REITs. As shown in Panel A of Table 13, the total institutional ownership is not significantly different between REITs and matched non-REITs. However, the turnover of non-REITs is significantly higher than that of REITs. Since institutional investors account for most of the stock trading volume, excessive trading is likely a channel through which institutional investors contribute to stock crash risk.

[Insert Table 13 about here]

Panel B of Table 13 provides further evidence that the investor base of non-REITs is more short-term orientated than that of REITs. On the one hand, transient institutional ownership is significantly lower for REITs than non-REITs. On the other hand, the ownership of long-term institutions, including both dedicated institutions and quasi-indexers, is significantly higher for REITs than non-REITs. More important, the regression results reported in Table 12 show that *transient* institutions significantly increase the crash risk of non-REITs, but not that of REITs. Transient institutional investors trade aggressively to maximize short-term trading gains. The short-term speculation of institutional investors could increase stock price volatility and even result in crashes. Therefore, compared to REITs, non-REITs have more transient institutional ownership, which significantly increases their crash risk.

Panel C of Table 13 compares the ownership by different legal type of institutional investors between REITs and non-REITs. While the ownership of investment companies is significantly lower for REITs than non-REITs, the ownership of both pension funds and insurance companies is significantly higher for REITs. Moreover, the regression results reported in Table 12 show that *investment companies* significantly increase the crash risk of non-REITs,

but not that of REITs. Investment companies include many short-term traders, such as hedge funds and broker/dealers with high-frequency trading strategies. REITs were not the primary trading targets of these institutions during the earlier period when the REIT sector was relatively small and less liquid. However, with exponential growth in the new era, REITs have become more integrated into the broad stock market. As reported earlier, the trading of investment companies has become positively related to the crash risk of REITs in recent years. Although less severe during the full sample period, the adverse impact of short-term institutions on REIT crash risk is worsening over time.

Conclusion

Institutional investors have become dominant players in the REIT market. However, there are opposing views on the role played by the REIT institutional investors. In this paper, we empirically examine the relationship between institutional investors and the stock crash risk of REITs. We find that institutional ownership dynamics has an important impact on REIT crash risk, and the impact depends on investor types. Specifically, we first classify institutional investors based on their legal type and find that the ownership of pension funds (bank trusts) is negatively (positively) related to REIT crash risk. In addition, the trading of investment companies has become positively related to REIT crash risk in recent years. Next, we classify institutional investors classified based on their investment behavior, and find that REIT crash risk is positively related to the trading of transient institutional investors, which trade frequently to maximize short-term gains. Moreover, the adverse impact of transient investors on REIT crash

risk has worsened recently. These results shed new light on the debate about REIT institutional investors and highlight the heterogeneous effects of institutional investors in the REIT sector.

While we focus on institutional investors in this paper, further analyses of other determinants of REIT crash risk are warranted. For example, future studies could take a closer look at the link between stock crash risk and the corporate governance of REITs. In addition, while our sample includes only equity REITs, it is also interesting to investigate the crash risk of mortgage REITs, which face a unique set of challenges, such as those brought on by the Federal Reserve's quantitative easing programs.

Appendix

NCSKEW A measure of crash risk, estimated as the negative conditional skewness of firm-specific weekly return, which is equal to the natural log of one plus the regression residua from Equation (1).

DUVOL A measure of crash risk, down-to-up volatility is calculated as the log of the ratio of the standard deviation of firm-specific weekly return on up weeks to that on down weeks.

COUNT A measure of crash risk, calculated as the number of crashes minus the number of jumps over the fiscal year. A crash (jump) occurs when the firm-specific weekly return is 3.09 standard deviations below (above) its mean over the fiscal year.

IO Percentage of total institutional ownership in the REIT. For each REIT in a sample year, we first calculate the total institutional holdings by adding the shares owned by all institutional investors of that REIT based on their 13f form filings in the Thomson Financial Institutional Holdings database. We then divide the total institutional holdings by the REIT's total number of shares outstanding obtained from CRSP.

IO_PEN Percentage ownership of pension funds in the REIT.

IO_BNK Percentage ownership of bank trusts in the REIT.

IO_INV Percentage ownership of investment companies in the REIT.

IO_INS Percentage ownership of insurance companies in the REIT.

IO_TRA Percentage ownership of transient institutional investors in the REIT.

IO_DED Percentage ownership of dedicated institutional investors in the REIT.

ROA Contemporaneous income before extraordinary items divided by the book value of total assets.

RET Average firm-specific weekly return over the fiscal year.

MTB Ratio of the market value of equity to the book value of equity at the end of the last fiscal year.

SIZE Natural log of the REIT's market value of equity at the end of the last fiscal year.

LEV Book value of all liabilities scaled by total assets at the end of the last fiscal year.

SIGMA Standard deviation of the firm-specific weekly return over the fiscal year.

DTURN Detrended turnover, which is calculated as the difference between average monthly turnover over fiscal year *t*-1 and the prior fiscal year's average monthly turnover.

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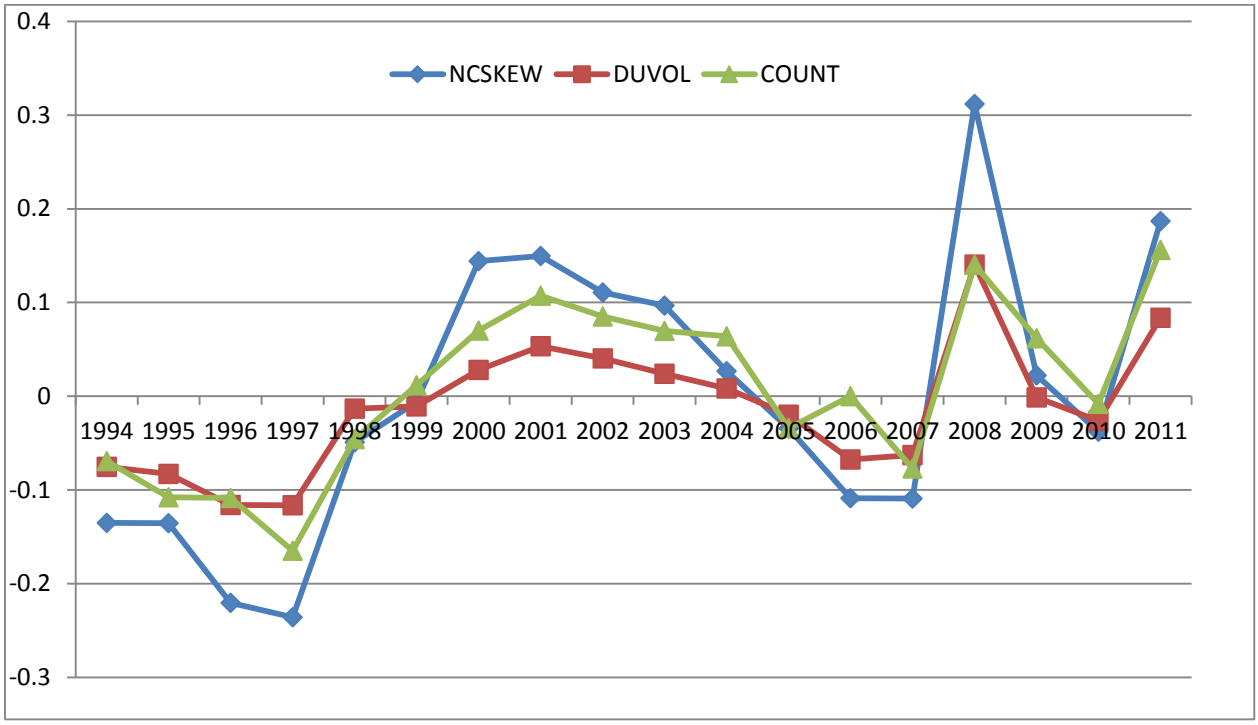
Figure 1: Average annual crash risk of REITs



This figure plots three measures of stock crash risk for a sample of public REITs incorporated in the U.S. from 1994 through 2011. NCSKEW is the negative conditional skewness. DUVOL is the down-to-up volatility. COUNT is the number of crashes minus the number of jumps over the fiscal year.

Table 1: Summary statistics

Variable	Mean	Std. Dev.	Min	25th	Median	75th	Max
NCSKEW	-0.009	0.780	-4.234	-0.387	-0.040	0.330	4.904
DUVOL	-0.015	0.352	-1.461	-0.227	-0.023	0.196	1.584
COUNT	0.003	0.608	-2.000	0.000	0.000	0.000	2.000
IO	0.519	0.301	0.000	0.272	0.551	0.764	0.905
IO_PEN	0.027	0.033	0.000	0.003	0.015	0.041	0.173
IO_BNK	0.083	0.059	0.000	0.039	0.073	0.117	0.271
IO_INV	0.348	0.213	0.000	0.166	0.359	0.523	0.782
IO_INS	0.037	0.037	0.000	0.012	0.029	0.050	0.221
IO_TRA	0.099	0.078	0.000	0.035	0.088	0.149	0.324
IO_DED	0.070	0.070	0.000	0.006	0.054	0.114	0.333
IO_QIX	0.343	0.210	0.000	0.175	0.345	0.498	0.788
ROA	0.025	0.036	-0.130	0.009	0.025	0.042	0.126
RET	-0.001	0.001	-0.027	-0.001	0.000	0.000	0.030
MTB	1.911	2.330	0.165	1.123	1.509	2.121	18.45
SIZE	6.116	1.609	0.435	5.193	6.262	7.239	10.28
LEV	0.484	0.191	0.000	0.394	0.498	0.600	0.932
SIGMA	0.030	0.020	0.009	0.019	0.024	0.033	0.233
DTURN	0.000	0.077	-0.723	-0.012	0.002	0.017	0.497

This table reports summary statistics for a sample of public REITs incorporated in the U.S. from 1994 through 2011. Variable definition is in the Appendix.

Table 2: Time distribution of sample

Year	*N*	*NCSKEW*	*IO*	*IO_PEN*	*IO_INV*	*IO_BNK*	*IO_INS*	*IO_TRA*	*IO_DED*	*IO_QIX*
1994	159	-0.135	0.342	0.012	0.241	0.043	0.041	0.077	0.060	0.200
1995	167	-0.135	0.368	0.016	0.262	0.044	0.042	0.072	0.069	0.225
1996	157	-0.220	0.370	0.018	0.265	0.046	0.036	0.067	0.076	0.221
1997	164	-0.236	0.434	0.018	0.317	0.053	0.041	0.088	0.080	0.264
1998	176	-0.049	0.421	0.019	0.297	0.052	0.047	0.085	0.061	0.271
1999	169	-0.006	0.406	0.013	0.286	0.055	0.043	0.077	0.064	0.255
2000	157	0.144	0.388	0.021	0.257	0.054	0.035	0.074	0.057	0.250
2001	149	0.150	0.392	0.018	0.264	0.053	0.032	0.079	0.057	0.248
2002	141	0.111	0.455	0.027	0.301	0.068	0.033	0.074	0.063	0.316
2003	143	0.097	0.499	0.027	0.319	0.087	0.031	0.084	0.063	0.344
2004	141	0.027	0.592	0.025	0.374	0.120	0.030	0.084	0.077	0.426
2005	147	-0.034	0.636	0.036	0.406	0.127	0.034	0.106	0.082	0.447
2006	128	-0.109	0.694	0.038	0.440	0.145	0.034	0.119	0.084	0.488
2007	117	-0.109	0.736	0.043	0.468	0.143	0.041	0.127	0.089	0.514
2008	114	0.312	0.762	0.049	0.479	0.152	0.042	0.145	0.074	0.536
2009	113	0.022	0.729	0.045	0.459	0.146	0.036	0.143	0.061	0.521
2010	123	-0.038	0.698	0.045	0.472	0.097	0.031	0.161	0.066	0.457
2011	128	0.187	0.752	0.040	0.553	0.082	0.028	0.181	0.081	0.435

This table reports the distribution of the sample of public REITs incorporated in the U.S. across fiscal year from 1994 through 2011. Variables are defined in the Appendix.

Table 3: Property type distribution of sample

Property Type	*N*	*NCSKEW*	*IO*	*IO_PEN*	*IO_INV*	*IO_BNK*	*IO_INS*	*IO_TRA*	*IO_DED*	*IO_QIX*
Hotel	245	0.069	0.554	0.019	0.378	0.096	0.037	0.134	0.060	0.352
Health Care	164	0.068	0.532	0.021	0.360	0.098	0.027	0.103	0.057	0.363
Residential	538	0.006	0.568	0.033	0.379	0.084	0.048	0.105	0.086	0.368
Office	532	-0.033	0.616	0.032	0.419	0.091	0.043	0.117	0.084	0.408
Retail	585	0.020	0.466	0.029	0.302	0.077	0.033	0.079	0.064	0.313
Self-Storage	107	-0.082	0.361	0.020	0.243	0.062	0.020	0.060	0.051	0.245
Specialty	136	-0.095	0.493	0.022	0.325	0.088	0.033	0.114	0.043	0.331
Diversified	286	-0.098	0.393	0.017	0.274	0.060	0.023	0.069	0.059	0.258

This table reports the distribution of the sample of public REITs incorporated in the U.S. across property type from 1994 through 2011. Property type data are from SNL. Variables are defined in the Appendix.

Table 4: REIT crash risk and institutional ownership

Dependent	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Variable	*NCSKEW*	*NCSKEW*	*NCSKEW*	*NCSKEW*	*DUVOL*	*DUVOL*	*DUVOL*	*DUVOL*	*COUNT*	*COUNT*	*COUNT*	*COUNT*
IO	0.045				0.005				0.026			
	(0.549)				(0.134)				(0.384)			
IO_TOP1		0.354				0.004				0.465		
		(0.965)				(0.025)				(1.479)		
IO_TOP5			0.175				0.014				0.137	
			(1.070)				(0.180)				(1.053)	
IO_BLOCK				0.045				0.041				0.036
				(0.330)				(0.653)				(0.318)
ROA	-0.725	-0.729	-0.692	-0.754	-0.499	-0.506	-0.499	-0.529*	-0.801	-0.765	-0.763	-0.812
	(-0.923)	(-0.932)	(-0.886)	(-0.967)	(-1.617)	(-1.645)	(-1.622)	(-1.724)	(-1.623)	(-1.562)	(-1.545)	(-1.647)
NCSKEW_LAG	0.043*	0.043*	0.042*	0.043*	0.017	0.017	0.017	0.017	0.022	0.021	0.021	0.022
	(1.856)	(1.854)	(1.841)	(1.870)	(1.589)	(1.592)	(1.587)	(1.592)	(1.312)	(1.294)	(1.292)	(1.322)
RET	14.791	13.311	13.335	14.273	3.052	3.064	2.938	3.474	8.062	6.154	6.929	7.665
	(0.505)	(0.453)	(0.456)	(0.487)	(0.208)	(0.209)	(0.201)	(0.236)	(0.358)	(0.274)	(0.309)	(0.340)
MTB	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.212)	(0.152)	(0.180)	(0.161)	(0.438)	(0.430)	(0.432)	(0.426)	(0.145)	(0.114)	(0.134)	(0.122)
SIZE	0.033**	0.035**	0.032**	0.037***	0.018**	0.019***	0.018***	0.020***	0.031**	0.030***	0.029***	0.034***
	(2.014)	(2.525)	(2.223)	(2.694)	(2.403)	(3.054)	(2.796)	(3.229)	(2.538)	(2.859)	(2.699)	(3.197)
LEV	-0.052	-0.055	-0.059	-0.051	-0.015	-0.015	-0.016	-0.013	-0.094	-0.101	-0.100	-0.094
	(-0.495)	(-0.514)	(-0.553)	(-0.481)	(-0.322)	(-0.310)	(-0.329)	(-0.267)	(-1.030)	(-1.093)	(-1.093)	(-1.034)
SIGMA	-2.440	-2.541	-2.541	-2.478	-1.871	-1.870	-1.879	-1.838	-1.697	-1.829	-1.776	-1.726
	(-0.935)	(-0.973)	(-0.975)	(-0.949)	(-1.558)	(-1.554)	(-1.566)	(-1.530)	(-0.850)	(-0.919)	(-0.893)	(-0.865)
DTURN	-0.628**	-0.621**	-0.608**	-0.632**	-0.204*	-0.205*	-0.203*	-0.210*	-0.509**	-0.493**	-0.491**	-0.509**
	(-2.171)	(-2.136)	(-2.107)	(-2.187)	(-1.801)	(-1.801)	(-1.787)	(-1.857)	(-2.382)	(-2.318)	(-2.312)	(-2.395)
Observations	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166
R2	0.041	0.053	0.061	0.042	0.053	0.061	0.041	0.053	0.061	0.041	0.053	0.061

This table reports the regression results of stock price crash risk on institutional ownership and control variables for a sample of public REITs incorporated in the U.S. from 1994 through 2011. Regressions are run with intercept and year dummies (not reported). Robust *t* statistics are corrected for clustering of the residual at the REIT level. One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 5: REIT crash risk and institutional investors classified by legal type

Dependent	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Variable	*NCSKEW*	*NCSKEW*	*NCSKEW*	*NCSKEW*	*DUVOL*	*DUVOL*	*DUVOL*	*DUVOL*	*COUNT*	*COUNT*	*COUNT*	*COUNT*
IO_PEN	-1.377***				-0.697***				-1.150***			
	(-3.256)				(-3.486)				(-3.197)			
IO_INV		0.073				0.009				0.056		
		(0.704)				(0.177)				(0.637)		
IO_BNK			0.918**				0.429**				0.619*	
			(2.157)				(2.263)				(1.923)	
IO_INS				0.043				0.034				0.079
				(0.111)				(0.183)				(0.224)
ROA	-0.884	-0.713	-0.700	-0.778	-0.557*	-0.497	-0.467	-0.503	-0.918*	-0.781	-0.778	-0.839*
	(-1.129)	(-0.906)	(-0.895)	(-0.987)	(-1.812)	(-1.611)	(-1.523)	(-1.617)	(-1.894)	(-1.589)	(-1.597)	(-1.715)
NCSKEW_LAG	0.042*	0.043*	0.041*	0.043*	0.017	0.017	0.017	0.017	0.021	0.022	0.021	0.022
	(1.825)	(1.855)	(1.780)	(1.868)	(1.545)	(1.590)	(1.507)	(1.590)	(1.264)	(1.307)	(1.245)	(1.323)
RET	8.261	14.405	13.620	14.733	2.375	3.007	2.520	3.036	2.624	7.776	7.277	8.065
	(0.281)	(0.492)	(0.472)	(0.502)	(0.162)	(0.205)	(0.176)	(0.207)	(0.119)	(0.346)	(0.326)	(0.358)
MTB	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.002	0.001
	(0.204)	(0.209)	(0.359)	(0.165)	(0.487)	(0.438)	(0.618)	(0.442)	(0.154)	(0.152)	(0.234)	(0.106)
SIZE	0.052***	0.033**	0.024	0.038***	0.025***	0.018**	0.012*	0.018***	0.046***	0.030**	0.025**	0.035***
	(3.756)	(2.114)	(1.603)	(2.727)	(4.264)	(2.570)	(1.739)	(3.039)	(4.349)	(2.514)	(2.164)	(3.327)
LEV	-0.047	-0.053	-0.052	-0.049	-0.014	-0.015	-0.017	-0.015	-0.091	-0.096	-0.095	-0.091
	(-0.435)	(-0.500)	(-0.490)	(-0.462)	(-0.292)	(-0.324)	(-0.351)	(-0.323)	(-0.996)	(-1.043)	(-1.038)	(-1.002)
SIGMA	-3.016	-2.483	-2.481	-2.441	-2.162*	-1.876	-1.890	-1.871	-2.177	-1.729	-1.725	-1.699
	(-1.151)	(-0.953)	(-0.952)	(-0.936)	(-1.794)	(-1.565)	(-1.580)	(-1.558)	(-1.099)	(-0.868)	(-0.868)	(-0.852)
DTURN	-0.605**	-0.622**	-0.648**	-0.637**	-0.188	-0.203*	-0.210*	-0.204*	-0.487**	-0.502**	-0.521**	-0.516**
	(-2.073)	(-2.147)	(-2.239)	(-2.195)	(-1.648)	(-1.797)	(-1.851)	(-1.792)	(-2.290)	(-2.352)	(-2.448)	(-2.417)
Observations	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166
R2	0.055	0.053	0.055	0.053	0.064	0.061	0.063	0.061	0.044	0.041	0.042	0.041

This table reports the results of regressions of stock price crash risk on institutional ownership classified by legal type and control variables for a sample of public REITs incorporated in the U.S. from 1994 through 2011. Regressions are run with intercept and year dummies (not reported). Robust *t* statistics are corrected for clustering of the residual at the REIT level. One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 6: REIT crash risk and trading of institutional investors classified by legal type

Dependent Variable	(1) *NCSKEW*	(2) *NCSKEW*	(3) *NCSKEW*	(4) *NCSKEW*	(5) *DUVOL*	(6) *DUVOL*	(7) *DUVOL*	(8) *DUVOL*	(9) *COUNT*	(10) *COUNT*	(11) *COUNT*	(12) *COUNT*
IO_PEN	-1.557***				-0.768***				-1.507***			
	(-3.449)				(-3.596)				(-4.040)			
ΔIO_PEN	-1.202*				-0.543*				-0.354			
	(-1.689)				(-1.665)				(-0.597)			
IO_INV		0.019				0.013				0.012		
		(0.175)				(0.254)				(0.128)		
ΔIO_INV		0.164				0.043				0.074		
		(0.698)				(0.396)				(0.391)		
IO_BNK			0.976**				0.482**				0.692**	
			(2.107)				(2.231)				(2.084)	
ΔIO_BNK			0.915				0.371				0.477	
			(1.190)				(1.105)				(0.847)	
IO_INS				0.230				0.131				0.165
				(0.507)				(0.615)				(0.401)
ΔIO_INS				-0.185				-0.024				-0.262
				(-0.277)				(-0.073)				(-0.439)
Observations	1,954	1,954	1,954	1,954	1,954	1,954	1,954	1,954	1,954	1,954	1,954	1,954
R^2	0.055	0.053	0.055	0.053	0.063	0.060	0.062	0.060	0.045	0.040	0.042	0.041

This table reports the results of regressions of stock price crash risk on the trading of institutional investors classified by legal type for a sample of public REITs incorporated in the U.S. from 1994 through 2011. Regressions are run with control variables, intercept, and year dummies (not reported). Robust *t* statistics are corrected for clustering of the residual at the REIT level. One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 7: REIT crash risk and institutional investors classified by investment behavior

Dependent	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variable	*NCSKEW*	*NCSKEW*	*NCSKEW*	*DUVOL*	*DUVOL*	*DUVOL*	*COUNT*	*COUNT*	*COUNT*
IO_TRA	0.441			0.196			0.283		
	(1.554)			(1.470)			(1.219)		
IO_DED		-0.124			-0.151			-0.159	
		(-0.448)			(-1.249)			(-0.821)	
IO_QIX			0.031			0.004			0.038
			(0.272)			(0.070)			(0.390)
ROA	-0.804	-0.668	-0.756	-0.533*	-0.455	-0.502	-0.862*	-0.760	-0.803
	(-1.027)	(-0.849)	(-0.961)	(-1.730)	(-1.471)	(-1.625)	(-1.777)	(-1.543)	(-1.633)
NCSKEW_LAG	0.043*	0.043*	0.043*	0.017	0.017	0.017	0.022	0.022	0.022
	(1.871)	(1.859)	(1.861)	(1.598)	(1.581)	(1.590)	(1.324)	(1.312)	(1.309)
RET	14.840	11.819	15.003	3.160	1.747	3.078	8.157	6.155	8.346
	(0.506)	(0.402)	(0.511)	(0.215)	(0.118)	(0.210)	(0.363)	(0.276)	(0.371)
MTB	0.001	0.002	0.001	0.001	0.002	0.001	0.001	0.001	0.001
	(0.173)	(0.281)	(0.189)	(0.471)	(0.530)	(0.433)	(0.137)	(0.188)	(0.151)
SIZE	0.042***	0.030**	0.036**	0.022***	0.015**	0.018**	0.038***	0.029***	0.032**
	(2.723)	(2.178)	(2.270)	(3.410)	(2.349)	(2.543)	(3.444)	(2.716)	(2.566)
LEV	-0.046	-0.054	-0.050	-0.012	-0.017	-0.015	-0.089	-0.096	-0.094
	(-0.430)	(-0.505)	(-0.473)	(-0.245)	(-0.360)	(-0.317)	(-0.974)	(-1.045)	(-1.028)
SIGMA	-2.412	-2.780	-2.409	-1.835	-2.021*	-1.867	-1.660	-1.916	-1.659
	(-0.925)	(-1.072)	(-0.919)	(-1.534)	(-1.677)	(-1.548)	(-0.835)	(-0.969)	(-0.829)
DTURN	-0.642**	-0.584**	-0.636**	-0.209*	-0.181	-0.205*	-0.519**	-0.480**	-0.512**
	(-2.216)	(-1.991)	(-2.195)	(-1.845)	(-1.574)	(-1.805)	(-2.438)	(-2.216)	(-2.401)
Observations	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166
R^2	0.053	0.054	0.053	0.062	0.062	0.061	0.041	0.042	0.041

This table reports the results of regressions of stock price crash risk on institutional ownership classified by investment behavior and control variables for a sample of public REITs incorporated in the U.S. from 1994 through 2011. Regressions are run with intercept and year dummies (not reported). Robust *t* statistics are corrected for clustering of the residual at the REIT level. One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 8: REIT crash risk and trading of institutional investors classified by investment behavior

Dependent Variable	(1) *NCSKEW*	(2) *NCSKEW*	(3) *NCSKEW*	(4) *DUVOL*	(5) *DUVOL*	(6) *DUVOL*	(7) *COUNT*	(8) *COUNT*	(9) *COUNT*
IO_TRA	0.392			0.173			0.208		
	(1.291)			(1.195)			(0.844)		
ΔIO_TRA	0.895*			0.371*			0.386*		
	(1.867)			(1.708)			(1.649)		
IO_DED		-0.238			-0.205			-0.244	
		(-0.869)			(-1.634)			(-1.099)	
ΔIO_DED		-0.492			-0.281			-0.266	
		(-1.265)			(-1.474)			(-0.838)	
IO_QIX			0.022			0.005			0.036
			(0.179)			(0.086)			(0.358)
ΔIO_QIX			0.100			0.035			0.073
			(0.353)			(0.289)			(0.350)
Observations	1,954	1,954	1,954	1,954	1,954	1,954	1,954	1,954	1,954
R^2	0.053	0.055	0.052	0.061	0.062	0.060	0.041	0.041	0.040

This table reports the results of regressions of stock price crash risk on the trading of institutional investors classified by investment behavior for a sample of public REITs incorporated in the U.S. from 1994 through 2011. Regressions are run with control variables, intercept, and year dummies (not reported). Robust *t* statistics are corrected for clustering of the residual at the REIT level. One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 9: REIT crash risk and trading of institutional investors classified by legal type in the 21st century

Dependent Variable	(1) *NCSKEW*	(2) *NCSKEW*	(3) *NCSKEW*	(4) *NCSKEW*	(5) *DUVOL*	(6) *DUVOL*	(7) *DUVOL*	(8) *DUVOL*	(9) *COUNT*	(10) *COUNT*	(11) *COUNT*	(12) *COUNT*
IO_PEN	-2.212***				-0.921***				-2.336***			
	(-2.948)				(-2.685)				(-3.904)			
ΔIO_PEN	-1.724**				-0.705*				-0.742			
	(-2.049)				(-1.748)				(-1.114)			
IO_INV		0.110				0.006				0.054		
		(0.740)				(0.098)				(0.454)		
ΔIO_INV		0.655**				0.312**				0.100*		
		(1.996)				(2.100)				(1.653)		
IO_BNK			0.597				0.159				0.372	
			(0.958)				(0.596)				(0.954)	
ΔIO_BNK			1.615*				0.608				0.643	
			(1.779)				(1.607)				(0.962)	
IO_INS				1.005				0.395				0.457
				(1.035)				(0.864)				(0.587)
ΔIO_INS				0.362				0.369				0.299
				(0.241)				(0.567)				(0.252)
Observations	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144
R^2	0.064	0.057	0.057	0.056	0.069	0.065	0.064	0.064	0.053	0.042	0.042	0.042

This table reports the results of regressions of stock price crash risk on the trading of institutional investors classified by legal type for a sample of public REITs incorporated in the U.S. from 2000 through 2011. Regressions are run with control variables, intercept, and year dummies (not reported). Robust *t* statistics are corrected for clustering of the residual at the REIT level. One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 10: REIT crash risk and trading of institutional investors classified by investment behavior in the 21st century

Dependent Variable	(1) *NCSKEW*	(2) *NCSKEW*	(3) *NCSKEW*	(4) *DUVOL*	(5) *DUVOL*	(6) *DUVOL*	(7) *COUNT*	(8) *COUNT*	(9) *COUNT*
IO_TRA	0.171			0.009			0.158		
	(0.452)			(0.052)			(0.522)		
ΔIO_TRA	1.213**			0.532**			0.185*		
	(2.167)			(2.120)			(1653)		
IO_DED		-0.074			-0.109			-0.253	
		(-0.177)			(-0.603)			(-0.778)	
ΔIO_DED		-0.259			-0.044			-0.170	
		(-0.448)			(-0.167)			(-0.396)	
IO_QIX			0.112			0.015			0.021
			(0.690)			(0.214)			(0.172)
ΔIO_QIX			0.605			0.279*			0.256
			(1.609)			(1.773)			(0.984)
Observations	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144
R^2	0.056	0.058	0.057	0.063	0.067	0.064	0.042	0.042	0.042

This table reports the results of regressions of stock price crash risk on the trading of institutional investors classified by investment behavior for a sample of public REITs incorporated in the U.S. from 2000 through 2011. Regressions are run with control variables, intercept, and year dummies (not reported). Robust *t* statistics are corrected for clustering of the residual at the REIT level. One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 11: Comparing the crash risk of REIT v.s. non-REIT stocks

Crash Risk	Sample	Mean	Difference in Means (*t*-statistic)	Standard Deviation
NCSKEW	REIT stocks	-0.009	0.114* (1.89)	0.780
	Non-REIT stocks	-0.053		0.868
DUVOL	REIT stocks	-0.015	0.038* (1.93)	0.352
	Non-REIT stocks	-0.052		0.381
COUNT	REIT stocks	0.003	0.027 (1.47)	0.608
	Non-REIT stocks	-0.024		0.682

This table compares the three crash risk measures of REITs and non-REIT Compustat firms (matched by market capitalization) incorporated in the U.S. from 1994 to 2011. The REIT (non-REIT) sample consists of 2,593 (2,410) obervations. The table reports the means and starndard deviations of the two samples and the *t*-statistics for difference in means. One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 12: Regression results of REIT vs. non-REIT stocks

Panel A: Non-REITs

Dependent Variable	(1) *NCSKEW*	(2) *NCSKEW*	(3) *NCSKEW*	(4) *DUVOL*	(5) *DUVOL*	(6) *DUVOL*	(7) *COUNT*	(8) *COUNT*	(9) *COUNT*
IO	0.198**			0.077**			0.127*		
	(2.272)			(2.054)			(1.773)		
IO_TRA		0.510**			0.232**			0.366**	
		(2.578)			(2.831)			(2.338)	
IO_INV			0.227**			0.082*			0.123*
			(2.122)			(1.767)			(1.654)
Observations	2,123	2,123	2,123	2,123	2,123	2,123	2,123	2,123	2,123
R2	0.108	0.108	0.107	0.112	0.113	0.111	0.077	0.078	0.076

Panel B: REITs

Dependent Variable	(1) *NCSKEW*	(2) *NCSKEW*	(3) *NCSKEW*	(4) *DUVOL*	(5) *DUVOL*	(6) *DUVOL*	(7) *COUNT*	(8) *COUNT*	(9) *COUNT*
IO	0.045			0.005			0.026		
	(0.549)			(0.134)			(0.384)		
IO_TRA		0.441			0.196			0.283	
		(1.554)			(1.470)			(1.219)	
IO_INV			0.073			0.009			0.056
			(0.704)			(0.177)			(0.637)
Observations	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166	2,166
R2	0.041	0.053	0.053	0.053	0.062	0.061	0.061	0.041	0.041

This table compares the regression results of crash risk on institutional ownership of REITs and non-REITs (matched by market capitalization) incorporated in the U.S. from 1994 to 2011. Regressions are run with intercept, control variables, and year dummies (not reported). Robust *t* statistics are corrected for clustering of the residual at the firm level. One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.

Table 13. The institutional ownership and turnover of REIT v.s. non-REIT stocks

Panel A: Total institutioanl ownership and stcok turnover

Institutional Ownership	Sample	Mean	*t*-statistic	Median	*z*-statistic
IO	REIT stocks	0.519	0.48	0.551	1.00
	Non-REIT stocks	0.523		0.537	
TURNOVER	REIT stocks	0.104	-15.46***	0.071	-15.12***
	Non-REIT stocks	0.171		0.117	

Panel B: Institutional ownership classified by investment behavior

Institutional Ownership	Sample	Mean	*t*-statistic	Median	*z*-statistic
IO_TRA	REIT stocks	0.099	-12.23***	0.088	-5.84***
	Non-REIT stocks	0.132		0.110	
IO_DED	REIT stocks	0.070	1.75*	0.054	4.34***
	Non-REIT stocks	0.066		0.040	
IO_QIX	REIT stocks	0.343	3.96***	0.345	3.10***
	Non-REIT stocks	0.320		0.314	

Panel C: Institutional ownership classified by legal type

Institutional Ownership	Sample	Mean	*t*-statistic	Median	*z*-statistic
IO_PEN	REIT stocks	0.027	7.84***	0.015	0.552
	Non-REIT stocks	0.020		0.015	
IO_BNK	REIT stocks	0.083	0.25	0.073	-1.20
	Non-REIT stocks	0.083		0.076	
IO_INV	REIT stocks	0.348	-3.38***	0.359	-1.69*
	Non-REIT stocks	0.369		0.364	
IO_INS	REIT stocks	0.037	3.33***	0.029	7.91***
	Non-REIT stocks	0.033		0.022	

This table compares the institutional ownerhsip and stock turnover of REITs and non-REIT Compustat firms (matched by market capitalization) incorporated in the U.S. from 1994 to 2011. The REIT (non-REIT) sample consists of 2,593 (2,410) obervations. The table reports the means (medians) of the two samples and the *t*-statistics (z-statistics) of the t (Wilcoxon rank sum) test for difference in means (medians). One asterisk indicates significance at the 10% level; two indicate significance at the 5% level; three indicate significance at the 1% level.