Does Market Liquidity Matter for Firm Value? Evidence from Real Estate Investment Trusts

Abstract

This study investigates how market liquidity can improve firm value of Real Estate Investment Trusts (REITs). Using a sample of REITs in US from 1992 to 2008, we find that market illiquidity, measured by Amihud illiquidity, effective spread, quoted spread and percentage of zero volume days, has a significant and negative impact on future firm performance (Tobin's Q and ROA). The impact of market illiquidity on firm value is more economically significant for Cyclical REITs, and for REITs with higher idiosyncratic risk, with no analyst coverage, and with no hedge fund equity ownership. These findings suggest that market liquidity can increase firm value by stimulating informed trading and mitigating information asymmetry. Moreover, the impact of market illiquidity on firm value is more significant for Diversified REITs than other REITs, suggesting that the monitoring effect of market liquidity is more important for REITs with moral hazard problems. Further, market liquidity improves the efficiency of managerial incentive contracts by enhancing CEO's Pay-for-Performance-Sensitivity. Lastly, market illiquidity has a time-varying impact on firm value, with a larger impact during the subprime and financial crises.

Keywords: Market Liquidity; REIT; Asymmetric Information, Corporate Governance; Managerial Compensation

JEL Classifications: G12, G14, G29, G30, G34, G39

I. Introduction

Does market liquidity matter for firm value? In theory, there are different mechanisms through which market liquidity can have important impact on corporate governance and firm value. A more liquid market can improve stock price informativeness and performance monitoring (Diamond and Verrecchia, 1981; Holmstrom and Tirole, 1993), and provide more incentives for insiders to create value (Faure-Grimaud and Gromb, 2004). Kyle and Vila (1991), Kahn and Winton (1998), Maug (1998), and Noe (2002) also support the notion that market liquidity can reduce large shareholders' cost of monitoring managerial decisions and increase effectiveness of market monitoring. Maug (1998) concludes that liquid stock markets tend to support effective corporate governance.

Empirically, Fang, Noe, and Tice (2009) provide evidence that an increase in liquidity can improve the firm value and try to disentangle the underlying effects of market liquidity on firm value. First, due to stock price feedback effect, liquidity stimulates trades by informed investors; this result in more informative stock prices, better incentive effects of managerial pay-for-performance contracts, and hence more efficient corporate decisions. Second, due to moral hazard (agency) effect, liquidity permits non-blockholders to form toehold stake to monitor management. Furthermore, Chung, Elder, and Kim (2010) find that firms may alleviate information-based trading and improve stock market liquidity by adopting corporate governance standards that mitigate informational asymmetry.

The Real Estate Investment Trust (REIT) industry offers a good setting to test the economic effects on firm value as the above literature suggested. Given the information asymmetry and corporate governance problems in REITs, (Ghosh and Sirmans, 2003; Han, 2006; and Bianco, Ghosh, and Sirmans, 2007), market liquidity can be important in enhancing firm value for REITs.[1] Capozza and Seguin (1999) find that diversified REITs have lower value due to poorer liquidity associated with information asymmetry and agency costs. Ambrose and Lee (2009) find that more liquid and efficiently priced REITs are associated with better capital budgeting decisions. Brounen, Eichholtz and Ling (2009) find that the empirical link between liquidity and firm value is not as conclusive as documented, due to elusiveness of market liquidity. They conclude that further investigation of the effect of liquidity on firm value is an important future research direction. In essence, the economic roles of market liquidity on improving firm value of REITs remain an important yet relatively unexplored terrain for research.

Given these important gaps in real estate literature, this paper is among the first to offer a comprehensive study of different economic channels through which market liquidity can improve firm value of REITs. We test different theories that represent underlying mechanisms through which market liquidity can affect asymmetric information, corporate governance, managerial incentives, and ultimately firm value. To explore the underlying economic mechanisms and firm heterogeneity where market liquidity can affect REIT firm value, we examine our result sensitivity for sub-samples based on various firm-level characteristics of

[1] See Cannon and Cole (2010) for examinations of REIT liquidity and its determinants over the period of 1988 – 2007.

REITs, including information asymmetry, agency cost, and property types of REITs. We also examine how the relation between REIT liquidity and firm performance evolves over time, possibly due to changes in corporate governance and regulatory environment in the REIT industry, and other recent events such as the subprime and financial crises. Equally important, we are among the first to examine the impact of market liquidity on the efficiency of managerial incentive contracts, an important link that explains how market liquidity improves firm value.

Using data of 212 equity REITs from 1992 to 2008, our empirical analysis yields the following sets of interesting and important results. First, our univariate analysis suggests that equity REITs in our sample have a lower price impact, but have a wider spread than firms in other industries. Our sub-samples reveal that REITs with lower liquidity (such as Diversified REITs) are more likely to be opaque and have lower firm values. In contrast, residential and healthcare/industrial REITs are the most liquid and with higher firm values (Q).

Second, market illiquidity, measured by Amihud illiquidity, effective spread, quoted spread and percentage of zero volume days, has a significant and negative impact on firm value of REITs, proxied by Tobin's Q and ROA. This result suggests that liquidity is an economically important determinant of value, and is consistent with Brounen et al.'s (2009) result on the effect of Amihud measure of illiquidity on value. In comparison with Fang et al. (2009) that examines non-financial firms, our regression results show that the economic impact of liquidity on Tobin's Q ratio is more than 20 times larger for REITs than that for non-financial firms. This difference could potentially be attributable to the high information asymmetry and corporate governance problems in REITs.

Third, market liquidity has differential impacts on firm value due to heterogeneity in REITs and their fundamental characteristics. Market illiquidity has a significant and larger negative impact on firm value for REITs with high idiosyncratic volatility, no analyst coverage, no hedge fund ownership, and for Cyclical REITs. This finding is consistent with the stock price feedback effect of market liquidity (Fang et al., 2009) where firms with higher information asymmetry are more likely to benefit more from an increase in market liquidity and public trading. Equally important, our finding is also consistent with the agency and corporate governance effect of market liquidity. We find that market illiquidity has a larger adverse impact on firm value for Diversified REITs with higher information asymmetry and agency problems. This finding is consistent with Capozza and Seguin (1999) that corporate focus increases firm value due to higher trading volume (better liquidity).[2]

Fourth, the impact of market liquidity on firm value can be influenced by the structure of stock exchanges. Market illiquidity has a larger negative impact on firm value for REITs listed in the NYSE than those in AMEX or NASDAQ. This finding provides new evidence that favors floor-based trading structure (NYSE) over other trading structures (Huang and Stoll, 1996; Venkataraman, 2001). This complements the result of Cannon and Cole (2010) that REITs traded in the NYSE experience larger improvements in market liquidity over time compare with those listed in AMEX and NASDAQ.

[2] Capozza and Seguin (1999) measure liquidity using trading volume, which may proxy for effects other than liquidity such as algorithmic trading and firm size. Hence, we use other measures of liquidity. Further, Capozza and Seguin (1999) examine the impact of corporate focus on firm value, while our study focuses on the economic impact of liquidity on firm value.

Fifth, market illiquidity has a significant and negative impact on firm value for all years from 1992 to 2008 in our sample, and the impact varies with some major events in the REIT industry and financial markets. The negative impact of illiquidity on firm value is significantly reduced in early 2000s possibly due to the Decimalization in 2001 and the strengthened governance and regulatory environment in the REIT industry over time. In contrast, the negative impact of illiquidity on firm value increases during the recent subprime and financial crises, and the impact is the largest during the down-market (e.g. 1998, and 2008).

Sixth, our results are remarkably robust to alternative model specifications. Further robustness test reveals the causal relationship between market liquidity and firm value – lower market illiquidity has a significant and positive impact on firm value, yet higher firm value does not have a strong and significant impact on market liquidity. This finding addresses the potential reverse causality problem, and suggests that the main effect of market liquidity on firm value prevails with the possibility of simultaneity in that relationship.

Lastly, we find that market liquidity can improve the Pay-for-Performance Sensitivity (PPS), suggesting that liquidity enhances managerial incentives and efficiency of managerial compensations. The intuition for this finding is that improved liquidity lowers monitoring costs borne by the large shareholder, results in more efficient managerial contracts and higher PPS. This finding is important in its own right. It implies that a liquid financial market not only creates more informative prices that can incentivize managers to engage in value-increasing activities (Faure-Grimaud and Gromb, 2004) but it also improves the efficiency of managerial incentive contracts that are based on the firm's performance.

Overall, our findings contribute to the existing real estate literature by providing important new evidence that market liquidity can have material impacts on REIT value. The value implications of market liquidity vary with firm-types and property-types of REITs, as well as changes in the REIT industry and financial markets over time. Our findings highlight two distinctive effects of market liquidity on firm value: information acquisition and corporate governance. Further, we provide new insights on the effect of market liquidity on the managerial incentive, an important direction that is under-studied by existing literature. Lastly, our research not only contributes to real estate literature but also provides important contributions to finance literature by bridging the gap between market microstructure and corporate finance.

The rest of the paper is organized as follows. Section II provides literature review. Section III describes hypotheses and methodologies. Section IV discusses the data and summary statistics. Empirical results are presented and discussed in Section V. Finally, Section VI concludes the paper with summary, implications and contributions.

II. Literature Review

Our paper explores how market microstructure of REITs can have material impacts on firm value of REITs, and how the value impacts of market liquidity are related to information and corporate governance problems in REITs. Hence, this paper is related to and sheds new light to the following strands of literature.

A. Market Liquidity and Firm Value

In theory, market liquidity matters for firm value with the following economic effects. First, more liquid securities are expected to have higher values as rational investors discount securities less because of lower trading costs, ceteris paribus (Amihud and Mendelson, 1986; Kamara, 1994; Eleswarapu, 1997). As investors require a higher return to hold stocks with greater private information (Easley, Hvidjkaer, and O'Hara, 2002), improved liquidity mitigate this information asymmetry problem as informed traders can disguise their trades and lower their price impact in a more liquidity market. Easley and O'Hara (2004) show that market microstructure can help a firm to reduce its cost of capital by affecting the precision and quantity of information available to investors. Second, market liquidity could enhance performance monitoring (Diamond and Verrecchia, 1981; Holmstrom and Tirole, 1993), improve manager incentives to engage in value-increasing activities (Faure-Grimaud and Gromb, 2004) and increase the effectiveness of corporate governance (Kyle and Vila, 1991, Kahn and Winton, 1998, Maug, 1998, and Noe, 2002). Also, market liquidity can improve stock price informativeness (Holmstrom and Tirole, 1993; Faure-Grimaud and Gromb, 2004), which can ultimately improve corporate decisions and firm performance (Khanna and Sonti, 2004; Ferreira and Laux, 2007).

The empirical relationship between market liquidity and firm value remains an important direction for research. Subrahmanyam and Titman (1999) provide evidence that the positive effect of liquidity on firm performance is greater for stocks with high operating income volatility or high R&D intensity. Fang et al. (2009) provide evidence that an increase in liquidity can improve the firm value, through increases in the information content of market prices and of performance-sensitive managerial compensation. Their result further rejects the argument by

Baker and Stein (2004) that higher liquidity simply proxies for higher investor sentiment. Chung, Elder, and Kim (2010) find that corporate governance affects market liquidity. They find that firms with better corporate governance have narrower spreads, higher market quality index, smaller price impact of trades, and lower probability of information-based trading.

B. Market Liquidity, Information and Governance Problems in REITs

If market liquidity has economic impacts on firm value as the above literature suggested, the REIT industry should offer a good setting to examine such impacts. The importance of market liquidity in enhancing firm information, performance monitoring, and managerial incentives could be greater for the REIT industry, because REITs exhibit high information asymmetry and agency cost (Ghosh and Sirmans, 2003; Han, 2006; and Bianco, Ghosh, and Sirmans, 2007) due to the following characteristics. First, the high breadth of ownerships in REITs prevents possible hostile takeovers, which reduces the effectiveness of external monitoring and control (Campbell, Ghosh and Sirmans, 1998; Ghosh and Sirmans, 2003; and Eichholtz and Kok, 2008). Second, the entangled managerial structure of the majority of REITs, Umbrella Partnership REIT (UPREITs), allows managers to simultaneously manage several small REITs and consequently aggravates the agency and monitoring problem. Third, diversification across property types by some REITs adversely affects their value due to more severe information asymmetry and higher agency costs (Capozza and Seguin, 1999).

Given these unique characteristics of REITs, market liquidity could be an important factor to support outside monitoring by informed investors, and hence could improve governance

and firm value.[3] Ambrose and Lee (2009) argue that information and liquidity are the main benefits of being public for REITs, and find that more liquid and efficiently priced REITs are associated with better capital budgeting decisions (measured by higher equity marginal q). Brounen et al. (2009) cannot find consistent evidence that different measures of market liquidity have significant impact on firm value for REITs, and conclude that the effect of liquidity on firm value requires further investigation. Cannon and Cole (2010) find that REIT liquidity has experienced dramatic changes over time: it improved during the early and mid-1990s, deteriorated during the late 1990s, and then improved dramatically during 2000 – 2006, with the notable exception of 2007. Nevertheless, the economic roles of market liquidity in affecting firm value of REITs, particularly how liquidity affects firm value through mitigating information asymmetry, or through improving managerial incentives and governance, remains understudied by the existing literature.

III. Hypotheses and Methodologies

A. Hypotheses

(i) REIT Market Liquidity and Firm Value

Our primary hypothesis is that market liquidity can improve firm value. Therefore we expect a positive relationship between market liquidity and firm value (i.e., a negative

[3] Hartzell, Sun and Titman (2006), Ambrose and Lee (2009), and Chung, Fung and Hung (2010) find that institutional investors are important in improving corporate governance and values of REITs. As such, market liquidity of REITs should be important to support institutional monitoring and governance as the theory suggested (see, e.g., Kyle and Vila (1991), Kahn and Winton (1998), Maug (1998), and Noe (2002)).

relationship between measure of market illiquidity and firm value). Given different measures of market illiquidity (see section IV.B.i), we propose the following hypothesis:

Hypothesis #1: Market illiquidity has a negative impact on firm value.

If market liquidity matters for firm value, the underlying channels can include the following effects and mechanisms.

(ii) Informational Effect of Market Liquidity on Firm Value

A liquid market encourages more investors to collect private information and trade on that information, and hence creates value through the stock-price feedback effect (Fang et al., 2009). Since market liquidity encourages more informed trading, firms with greater information asymmetry are expected to benefit more from improved market liquidity. We hypothesize that market liquidity can improve firm value through the effect of information production and price discovery. Given different measures of market illiquidity and different proxies for information asymmetry, we propose the following hypothesis:

Hypothesis #2: Market illiquidity has a larger negative impact on firm value for REITs that are subject to larger information asymmetry.

For REITs with high information asymmetry, market liquidity should be more important in enhancing informed trading and acquisition of firm information such as REITs future prospect

and growth opportunities. We employ three proxies for information asymmetry: REITs with higher idiosyncratic volatility, REITs that are not followed by financial analysts, and REITs that have no equity ownership by informed investors such as hedge funds. First, idiosyncratic volatility is a measure of the amount of private information incorporated in stock markets (Morck, Yeung and Yu, 2000, Durnev, Morck and Yeung, 2004, Chen, Goldstein and Jiang, 2007), and in REIT stock price (Ambrose and Lee, 2009). Hence, the illiquidity impact on performance should be higher for REITs with more idiosyncratic volatility. Second, analyst coverage reflects more informative stock price (Hong, Lim and Stein, 2000) and a lower degree of information asymmetry (Chang, Dasgupta and Hilary, 2006).[4] In addition to analyst coverage, hedge fund ownership can be a proxy for informed trading activities and hence less degree of information asymmetry. Chung, Fung, Shilling and Simmons-Mosley (2007) find that hedge funds are more informed investors, which have superior forecasting abilities of real estate stock returns relative to other institutional investors. Chung, Fung, Shilling and Simmons-Mosley (2010) find that hedge funds specialize in acquiring information for REITs about which there is relatively little adverse information, and hence hedge fund ownership increase price informativeness of REITs. According to Hypothesis #2 market liquidity (illiquidity) should have a larger positive (negative) impact on REITs that are more subject to information asymmetry problem, i.e. REITs with no/low analyst coverage and no/low hedge fund ownership.

(iii) Corporate Governance Effect of Market Liquidity on Firm Value

[4] In REIT industry, Devos, Ong, and Spieler (2007) find that analyst coverage increases Tobin's Q, and that mortgage REITs are the most transparent.

Managers may act in their own best interests at the expense of less informed minority shareholders, and the resultant agency problems will lower firm values (Bianco et al., 2007). We hypothesize that market liquidity can improve firm value through the effect of market monitoring and corporate governance. As such, we propose the following hypothesis:

Hypothesis #3: Market illiquidity has a larger negative impact on firm value for REITs that are subject to more severe corporate governance problems.

For REITs with poor corporate governance, costs of monitoring are particularly high due to their governance problems. As such, an improved liquidity should have a larger impact on firm value by lowering costs of market monitoring and improving corporate governance (Holmstrom and Tirole, 1993). Hence, the illiquidity impact on performance should be higher for REITs with poor corporate governance. Empirically, we use different measures of corporate governance characteristics, including leverage, and whether the CEO is also the Chairman of the Board of Directors (CEO Duality).

(iv) Different Types of REITs and Varying Effect of Market Liquidity

Market liquidity should have differential impacts on firm value due to heterogeneity in REITs and their fundamental characteristics. We expect the effect of market liquidity on firm value depends on the underlying property types of the REITs, due to the differences in their portfolios of assets and future prospects, and their informational and governance conditions. According to National Association of Real Estate Investment Trust (NAREIT), equity REITs can

be categorized into several groups: office, retail, residential, healthcare, and lodging/resorts. Each category has its distinct characteristics.

First, we hypothesize that market liquidity should have a larger positive impact on firm value for cyclical REITs. Empirical evidence suggests that market liquidity exhibits a cyclical trend as bid-ask spread is highly cyclical, especially in market turmoil (Jones, 2002). Hence, cyclical REITs, whose business and financial conditions are sensitive to business and market cycles, are more likely to be affected by changing cyclical trend in market liquidity. Moreover, cyclical REITs may face higher volatility, higher valuation uncertainty, and hence higher monitoring costs; as such, the information and monitoring effects of market liquidity should be larger for cyclical REITs. We separate cyclical vis-à-vis non-cyclical REITs based on the following REIT types. On the one hand, Office REITs are highly cyclical due to their long lead time to complete constructions.[5] Retail REITs are also sensitive to economic cycles. Lodging/Resort REITs are also highly cyclical because consumers' entertainment need is sensitive to economic downturns. On the other hand, Healthcare REITs own and sometimes operate health care properties such as nursing homes, medical clinics, and hospitals. They are more recession resistant due to the economy's steady demand for health care facilities. Residential REITs should also be less cyclical, although they have higher leverage (financial risk) than average REITs, and carry higher local market risk than the average because of their locations and demography.[6] As such, we propose the following hypothesis:

[5] Office REITs tend to overbuild during economic booms. In addition, their long lease terms (averaging 7-10 years or longer) put them in a disadvantage position when the economy is in a downturn.

[6] See Capozza and Lee (1995).

Hypothesis #4A: Market illiquidity has a larger negative impact on firm value for Cyclical REITs than for non-Cyclical REITs.

Second, we hypothesize that market liquidity should have a larger positive impact on firm value for REIT type that is subject to moral hazard problem if market liquidity can provide market monitoring and improve corporate governance (Holmstrom and Tirole, 1993). To maintain a high growth rate to justify a high level of managerial compensation, managers may diversify and invest in unrelated business. Since managers do not necessarily possess relevant expertise in unrelated business, we argue that Diversified REITs are more susceptive to the moral hazard problem. Hence, we expect market liquidity to be able to reduce the moral hazard problem and hence improve firm value as the following hypothesis suggests:

Hypothesis #4B: Market illiquidity has a larger negative impact on firm value for Diversified REITs than for REITs of other property types.

For example, the largest Diversified REIT in 2008, General Growth Properties went bankrupt in Apr. 2009. Over a 10 year period, its total assets increased by 13 times. Its rapid expansion and acquisitions were mainly financed by short-term debt. Subsequently, it went bankrupt in 2009 due to its inability to refinance its short-term debt during the recent financial crisis.

(v) Market Structure and Varying Effect of Market Liquidity

If market liquidity has a material impact on firm value through information acquisition and market monitoring, such an impact should be higher in more liquid markets like NYSE than in AMEX or NASDAQ. Huang and Stoll (1996) show that NASDAQ spreads are larger than NYSE benchmarks.[7] Venkataraman (2001) finds trade execution costs of similar stocks are higher in Paris Bourse (automated trading structure) than in NYSE (floor-based trading structure). Benveniste, Marcus and Wilhelm (1992) show that in NYSE floor-based trading system, information sharing on order flows and intrinsic value of the stock help reduce the information asymmetry and increase the effective liquidity. Hence, the illiquidity impact on performance should be higher for REITs listed on the NYSE as the following hypothesis suggests.

Hypothesis #5: Market illiquidity has a larger negative impact on firm value for REITs traded on the NYSE than for REITs traded on other exchanges.

(vi) Incentive Effect of Market Liquidity on Pay-for-Performance-Sensitivity (PPS)

If market liquidity has a positive impact on firm value through the effect of corporate governance (as stated in Hypothesis #3), one of the important governance mechanisms will be managerial incentives and compensations. Holmstrom and Tirole (1993) show that stock price contains performance information that cannot be extracted from firm's profitability and is useful in structuring managerial incentives. If the amount of information contained in the stock price depends on market liquidity, then firms with more liquid stocks should structure managerial

[7] See also Bessembinder and Kaufman (1997) and Christie (1998).

compensation contracts more sensitive to stock prices. Fang et al. (2009) find evidence that effective managerial compensation (high PPS) provides an important mechanism through which market liquidity can enhance firm performance. Since market liquidity can stimulate trades by informed investors, more information flow from improved liquidity increases the signal-to-noise ratio in stock prices, increases the gain from using stock-based compensation, and hence improves the managerial contracting efficiency. Furthermore, Kang and Liu (2010) show that more informed trading enhances executive incentives, suggesting that board of directors should consider underlying stock trading characteristics when structuring executive incentives. Hence, we have the following hypothesis that relates market liquidity effect to managerial incentive and compensation:

Hypothesis #6: Market illiquidity has a negative impact on Pay-for-Performance-Sensitivity (PPS).

B. Methodologies

(i) Variable Definitions

Different Measures of REIT Market Liquidity

To construct different measures of REIT market liquidity, we follow Cannon and Cole (2010) to compute market liquidity measures using daily data. Cannon and Cole (2010) show that REIT liquidity measures do not require micro-structure data (i) to facilitate the use of their

results as benchmarks for comparisons with results from international markets for which micro-structure data may be unavailable; and (ii) to provide benchmarks that do not require access to costly (and voluminous) micro-structure data. Since previous studies use a wide variety of proxies for market liquidity and there is no consensus that a particular measure always dominates the others, we use several measures that are widely adopted by previous studies for our analysis.[8] We follow Hasbrouck (2009) for estimation methodology of liquidity proxies from daily trading data from CRSP. The regression results reported in this paper are mainly based on Amihud (2002) measure of illiquidity (log_amihud) as Goyenko, Holden and Trzcinka (2009) show that Amihud's measure is one of best measures of price impact. Our robustness checks using alternative liquidity measures generate qualitatively similar results.

We use the logarithm of Amihud's measure of illiquidity (also known as Amihud's price impact), which is defined as the logarithm of one plus the average ratio of the daily absolute return to the dollar trading volume on day d for stock i, over year t (with D_{it} as the number of trading days for stock i in year t),[9]

$$Log\_amihud_{it} = \log(1 + \frac{1}{D_{it}} \sum_{d=1}^{D_{it}} \frac{|R_{idt}|}{DVol_{idt}})$$

where R_{idt} is the daily return on stock i in year t, and $DVol_{idt}$ is the daily dollar volume in millions for stock i in year t. The ratio measures the absolute percentage price change per dollar of daily

[8] See Lesmond, Ogden, and Trzcinka (1999), Lesmond (2005), Hasbrouck (2009) and Goyenko, Holden and Trzcinka (2009) for a comprehensive survey on empirical proxies for liquidity (effective trading costs). Following these studies, we do not use trading volume to measure market liquidity because trading volume may proxy effects other than liquidity such as algorithmic trading (Chordia, Roll and Subrahmanyam, 2008), and firm size (Lee and Swaminathan, 2000; Chordia and Swaminathan, 2000).

[9] We take the logarithm for all measures of illiquidity so that their distributions are closer to normal.

trading volume, representing the daily price impact of the order flow, à la Kyle (1985). Amihud (2002) states that this illiquidity measure is easy to construct (especially for long time series), as it only requires daily data on stock returns and transaction volumes.[10] Hasbrouck (2004) and Brennan and Subrahmanyam (1996) also show that Amihud's measure is a reliable microstructure estimate of illiquidity. Amihud's illiquidity is now a widely used metric in many areas of finance for measuring stock illiquidity, such as asset pricing (Acharya and Pedersen, 2005), analyst disagreement (Sadka and Scherbina 2007), ownership concentration (Rubin, 2007), dividend policy (Banerjee, Gatchev and Spindt, 2007), credit derivatives (Acharya and Johnson, 2007), and emerging markets (Bekaert, Harvey and Lundblad, 2007).

To address the measurement issue of stock liquidity, we also employ other traditional measures of liquidity in our empirical analysis, including the volume-weighted quoted spread and the volume-weighted effective spread, using daily trade data from the CRSP.[11] Studies that use closing spreads include Stoll and Whaley (1983), Amihud and Mendelson (1986), and Chalmers and Kadlec (1998). The effective spread (log_vwes) is defined as the logarithm of one plus the volume-weighted average of twice the difference of the closing price and the midpoint of the bid-and-ask quotes in absolute value, divided by the midpoint of the bid-and-ask quotes, for trading day d, in year t with D_{it} as the number of trading days for stock i in year t, Vol_{idt} is the daily transaction volume in shares for stock i on trading day d in year t,

[10] There are other measures of illiquidity from the microstructure literature, constructed from high frequency trade and quote data, and may not be available across many stock markets for long time periods. These measures are positively associated with the Amihud's illiquidity. See Amihud (p.33, 2002) for discussion.

[11] We use the daily ask/high and bid/low from the CRSP as bid and ask prices, because the data is not available for most NYSE stocks.

$$Log\_vwes_{it} = \log\Big(\ 1+\frac{\sum_{d=1}^{D_{it}} Vol_{idt} \times (2\times \frac{|\ PRICE_{idt} - (ASK_{idt} + BID_{idt})/2\ |}{(ASK_{idt} + BID_{idt})/2})}{\sum_{d=1}^{D_{it}} Vol_{idt}}\ \Big)$$

The quoted spread (log_vwqs) is defined as the logarithm of one, plus the difference between the bid-and-ask quotes divided by the midpoint of the bid-and-ask quotes, for trading day *d*, in year *t* (with D_{it} as the number of trading days for stock *i* in year *t*, Vol_{idt} is the daily transaction volume in shares for stock *i* on trading day *d* in year *t*,

$$Log\_vwqs_{it} = \log\Big(\ 1+\frac{\sum_{d=1}^{D_{it}} Vol_{idt} (\frac{(ASK_{idt} - BID_{idt}}{(ASK_{idt} + BID_{idt})/2})}{\sum_{d=1}^{D_{it}} Vol_{idt}}\ \Big)$$

We compute the averages of the daily spread measures over the firm-year in question. These spread measures are employed as robustness checks and to facilitate the comparison of our results with other empirical studies. In addition, we compute the logarithm of the percentage of zero volume days (log_pzvd) as an alternative liquidity measure of a firm. The economic interpretation of zero volume days is that firms with more liquid stocks should have fewer zero volume days.

Measures of Firm Value and Characteristics

We measure firm performance using Tobin's Q ratio and Return on Assets. Tobin's Q (q) ratio is defined as the market value of assets (the market value of equity + book value of

assets – book value of equity – balance sheet deferred taxes), divided by the book value of assets. Return on Assets (ROA) is defined as the Earnings before interest, taxes and depreciation, divided by total assets. SP500 dummy equals to unity if the firm is a member of the S&P500 firms, and zero otherwise. Delaware dummy (de) equals to unity if the firm is incorporated in Delaware, and zero otherwise. Age (log_age) is the logarithm of the firm's age. Firm size (log_at) is the logarithm of the firm's total assets. Analyst coverage (log_num) is the logarithm of one plus the number of analyst earnings estimates. Momentum (mom) is the 6-month market excess returns starting January of the year.

Measure of Pay-for-Performance-Sensitivity

To estimate the impact of market liquidity on managerial incentives and compensations, we compute the CEO option-grant Pay-for-Performance Sensitivity (PPS) as the product of the option delta and the fraction of equity represented by the award. We follow the literature and make the same assumptions as Yermack (1995) and Feng, Ghosh, He and Sirmans (2010), which are the leading practices in academic research on CEO option grants. We compute the option delta using the Black-Scholes model with dividends. First, we assume the price of the underlying stock at time of award equals the exercise price of the options as most executive stock options are issued at the money (Murphy, 1985; Yermack 1995; Feng et al. 2010. If the exercise price is not available, we assume the exercise price of the options equals to the year-end stock price. Second, dividend rate is defined as the annual dividend, divided by the year-end stock price. Interest rate is defined as the yield on 10-year treasury bonds during the last month of the fiscal year. Life of options is set to the longest period options are granted, or 10 years if the maximum

period is not available. The annualized volatility is estimated as the standard deviation of daily logarithmic stock return during the last 120 trading days of the fiscal year, multiplied by 254, which is the number of trading days in a typical year. Third, we only consider newly awarded options, consistent with Yermack (1995) and Feng et al. (2010). Fourth, the fraction of equity represented by the award is equal to the number of options granted divided by the number of shares outstanding at the beginning of the fiscal year. Finally, the PPS is multiplied by 1,000 to give the dollar change in the wealth of the CEO per $1,000 change in shareholder wealth.

(ii) Methodologies

In this section we present regression models to test hypotheses discussed in IIIA.[12] To test Hypothesis #1, we estimate the following regression:

$$Performance_{i,t+1} = a_0 + a_1 Illiquidity_{i,t} + a_2 Control_{i,t} + \varepsilon_{i,t} \quad (1)$$

where performance is measured by Tobin's q or Return on Assets (ROA) as defined above. The key explanatory variable is market illiquidity. We use four different measures of market illiquidity namely the logarithms of Amihud's illiquidity, volume-weighted quoted spread, volume-weighted effective spread, and percentage of zero volume days. We compute their decile rankings within each year. Each illiquidity measure is ranked from 0 to 9 each year, and then the ranking is divided by 9 to obtain a decile ranking from 0 to 1. We use this decile ranking procedure to account for the time trend, outlier (Sloan, 1996) and nonlinearity (Hirshleifer, Lim

[12] Estimation methods and robustness tests of the regression models are discussed in Section V.

and Teoh, 2009), and to facilitate the comparison of the liquidity impact across years (Kothari, Sabino and Zach, 2005). For instance, due to the event of Decimalization in 2001, the Amihud illiquidity decreases over time (see Table 3). This time-trend in illiquidity may create a problem in interpretation when we estimate regressions by pooling observations across years. Hence, we focus more on our results based on the decile rankings of the illiquidity measures. Control variables include SP500 dummy, Delaware (de) dummy, firm's age (log_age), firm size (log_at), analyst (log_num), and momentum (mom), which are defined before. Hypothesis #1 predicts that a_1 should be negative.

To test Hypotheses #2 to #5, we estimate the following:

$$Performance_{i,t+1} = a_0 + a_1 X_{i,t} + a_2 Illiquidity_{i,t} + a_3 X_{i,t} \cdot Illiquidity_{i,t} + a_4 Control_{i,t} + \varepsilon_{i,t} \quad (2)$$

where the performance, illiquidity measures and control variables are defined the same as in equation (1). To explore the underlying channels or mechanisms of liquidity impact on firm value, we introduce the dummy variables $X_{i,t}$ to identify firms with high information asymmetry (Hypotheses #2), firms with more severe corporate governance problems (Hypotheses #3), firms that are cyclical (Hypotheses #4A), firms that are diversified (Hypotheses #4B), and firms listed on NYSE (Hypotheses #5). Dummy variables X_{it} correspond to the following characteristics of REITs: Information asymmetric proxies include *High_Sigma*, *No_Analyst*, and *No_Hedgefund*. *High_Sigma* equals to 1 if the residual standard deviation estimated from the market model for the REIT is above the cross sectional median for the year, and 0 otherwise; *No_Analyst* equals to 1 if there are no analysts giving earnings forecasts for the REIT for the year, and 0 otherwise; *No_Hedgefund* = 1 if there is no hedge fund equity ownership for the REIT for the year, and 0

otherwise. Corporate governance proxies are *High_Leverage*, and CEO_*Duality*. *High_Leverage* equals 1 if total debt divided by total asset is above the median for the year, and 0 otherwise; CEO_*Duality* equals to 1 if CEO is the Chairman of the Board of Directors, and 0 otherwise. Further, we categorized the REITs into Cyclical or Non-cyclical, and Diversified or Non-Diversified. *Cyclical* equals to 1 if the REIT is a Diversified, Industrial/ Office, Resorts, Retail, or Storage REIT, and 0 otherwise; *Diversified* =1 if the REIT is a Diversified REIT, and 0 otherwise. *NYSE* Dummy is added, it equals to 1 if the REIT is listed on the New York Stock Exchange, and 0 otherwise. Finally, note that the partial derivative of Performance with respect to Illiquidity for equation (2) provide us additional insights into the decomposition of economic effects of illiquidity on firm value:

$$\frac{\partial Performance}{\partial Illiquidity} = a_2 + a_3 X_{i,t} \tag{3}$$

where a_2 captures the "baseline" effect of illiquidity on firm value, and a_3 captures the "additional" effect of illiquidity on firm value due to high information asymmetry, high corporate governance problem, particular REIT types (such as Cyclical or Diversified REITs), or NYSE exchange listing. Hypotheses #2 to #5 predict that a_3 should be negative as $X_{i,t}$ captures additional effects of illiquidity on firm value when dummy variables are used to control for high information asymmetry, poor corporate governance, Cyclical REITs, Diversified REITs, and REITs traded on the NYSE.

To estimate Hypothesis #6, we estimate the following:

$$PPS_{i,t+1} = a_0 + a_1 Illiquidity_{i,t} + a_3 Control_{i,t} + \varepsilon_{i,t} \quad (4)$$

Following Feng et al. (2010), we include control variables, *log_mktcap* (defined as the logarithm of market capitalization), CEO_*Duality*, *Tobin's Q* and *Leverage*, which have the same definitions used in equation (2). Since many REIT CEOs do not receive any stock options, their PPS value would be zero. Hence, we follow the literature (Yermack, 1995; Feng et al., 2010) to use TOBIT model to estimate equation (4) to account the fact that PPS is truncated at zero. Hypothesis #6 predicts that a_1 should be negative.

IV. Data and Summary Statistics

Our REIT sample consists of 1879 firm-year observations, for 212 equity REITs from NYSE, AMEX, and NSADAQ, from 1992 to 2008. Daily returns data are gathered from CRSP/Ziman Real Estate database. Annual financial data are obtained from the CRSP and COMPUSTAT databases. The data on CEO compensation are collected from SNL database. In addition, we collect data for analyst coverage from I/B/E/S, and hedge fund ownership from the Thomson Ownership Data.[13] To control for outliers, we winsorize our variables at top and bottom 1%.

Table 1 reports summary statistics for our illiquidity variables in logarithms. In unreported results, the Amihud illiquidity measure in our sample has a mean of 1.203, a standard

[13] We classify all institutions whose primary investment style is "hedge fund" as Hedge Fund, and compute the percentage equity ownership by hedge fund based on this.

deviation of 6.345, and a median of 0.011. These numbers match the range as well as the cross-sectional variation reported by Hasbrouck (2009). For a random sample of 300 US listed firms from 1993 to 2005, Hasbrouck (2009) reports that the Amihud illiquidity has an average of 3.65, a standard deviation of 20.04 and a median of 0.071. The effective spread measure in our sample has a mean of 0.011 with a standard deviation of 0.020 and a median of 0.005. Our quoted spread measure has a mean of 0.021 with a standard deviation of 0.030 and a median of 0.013. These distributions are consistent with Hasbrouck (2009) and Goyenko et al. (2009). Compared to REIT market illiquidity measures estimated by Cannon and Cole (2010), the statistics of our market illiquidity measures reported in Table 1 are slightly different from theirs due to difference in sample periods. Cannon and Cole (2010) cover the year 1988-2007, while our sample covers 1992-2008. Since the liquidity in earlier years are worse than that for later years, it is understandable that our measures of liquidity from 1992-2008 are somewhat better than those reported in Cannon and Cole (2010) from 1988-2007.[14] Also, we winsorize our illiquidity measures at top and bottom 1%. This accounts for the narrower distributions for our illiquidity measures.

Table 2 reports summary statistics for our REIT sample for each Property type. Our discussions are primarily based on the median statistics. Table 2 reveals that Resorts and Diversified REITs have lowest firm valuations (Q). One possible explanation is that Diversified

[14] To make sure that our estimates of market illiquidity are comparable to Cannon and Cole (2010), we re-compute the statistics of all our illiquidity measures from 1988-2007 (the sampling period used by Cannon and Cole (2010)). This robustness check (results not reported here) show that the statistics of our market illiquidity measures are in fact very close to those reported by Cannon and Cole (2010); e.g. our median Amihud illiquidity is 0.022 while the median Amihud illiquidity reported by Cannon and Cole (2010) is 0.028. Since market illiquidity varies over time, we also report year-by-year change in market illiquidity in Table 3, which reveal similar time-series patterns as reported by Cannon and Cole (2010).

REITs are more likely to subject to the agency problem. Consistent with Chung, Fung and Hung (2010), Resort REITs are highly cyclical because consumers' entertainment need is very sensitive to economic downturns. Hence, they are associated with the lowest firm valuation. Diversified REITs are most illiquid, possibility due to their opaqueness and complexity. The observation that they are both worst performer and illiquid is consistent with theory that poor governance firms (those that are subject to more severe incomplete contracting and moral hazard problems) are less transparent and have lower liquidity. Jin and Myers (2006) find that lack of transparency decreases firm-specific information by shifting firm specific risk to managers. As such, opaque stocks with low firm-specific information are more likely to deliver large negative returns. In contrast, residential and healthcare REITs, those with higher firm value (Q), are most liquid.

Market liquidity and its possible effects on firm value can be varying over time due to changing market conditions and firm characteristics. Table 3 presents the time-series of median Q and median market liquidity (log_amihud) over time and across different property types. Several observations are in order. First, Decimalization in 2001 significantly reduced illiquidity of REITs across all property types. This is consistent with Fang et al. (2009). Also, similar to Fang et al.'s (2009) finding that decimalization increased liquidity more for actively traded stocks, Table 3 shows that REIT property types which are more actively traded (lower illiquidity) or with better performance (Q) experience larger increases in liquidity during Decimalization; e.g. Healthcare REITs, with better performance and liquidity, experienced a larger drop in illiquidity than less efficient Diversified REITs. Second, Table 3 reveals that REIT market illiquidity is higher in the 1990s and much lower in the past decade. This pattern can also

be explained by strengthened corporate governance and regulatory environment in the REIT industry over time [Zhu, Ong and Yeo (2010)], and the emergence of substitute governance mechanism such as The Sarbanes-Oxley Act (SOX) of 2002 that strengthens firms' internal control and disclosure requirement [Li, Pincus, and Rego (2008), Zhu et al.(2010)]. Third, during the recent 2007 – 2009 subprime mortgage and financial crises, illiquidity increases significantly for Diversified REITs (with Q decreases significantly), Industrial/Office REITs, Resorts REITs, Residential REITs, Retail REITs, and Storage REITs. In contrast, Healthcare REITs, which are more resistant to economic shocks, experience a decrease in illiquidity during the financial crises.

Lastly, we also provide an anecdotal analysis of the market illiquidity of individual REIT companies for each of the REIT property types in Table 4. We identify the largest REIT company (in terms of total assets) for each property type in 2008, and look at how their market illiquidity and one-year ahead firm value (q) change over time. The highlight of the table is, from 2007 to 2008, the Amihud measure of illiquidity for General Growth Properties increased significantly from 0.0002 to 0.0025. General Growth subsequently went bankrupt in 2009 due to its ability to refinance its short-term debt. This shows that information asymmetry dramatically deteriorates when companies approaching financial distress.

V. Empirical Results

A. Does Market Liquidity Improve Firm Value of REITs?

In this section, we examine the impacts of different measures of market illiquidity on

firm value. Table 5 reports the regression results of Tobin's Q ratios and returns on assets on different measures of market illiquidity measures. The regressions are estimated with the Huber/White/Sandwich estimation of robust variance and clustered standard errors adjusted for intragroup correlation.[15] Our findings are among the first to document that market illiquidity has a significant and negative impact on firm value of REITs. They are remarkably robust to alternative model specifications, and different measures of illiquidity.[16]

In Panel A of Table 5, we examine the impacts of market illiquidity measures on firm value of REITs, measured by one-year ahead Tobin's Q and ROA respectively. All measures of market illiquidity, Amihud illiquidity measure, the volume-weighted quoted spread, the volume-weighted effective spread, and the percentage of zero volume days, have significant and negative impacts on Tobin's Q and ROA respectively. We also compute the economic magnitude of the impact of illiquidity on firm value, and find that a standard deviation change in illiquidity (log_amihud) implies an –0.142 = 0.634*(–0.224) change in Q. To compare the impact of liquidity of firm value for REITs versus industrial firms, we compute the economic impact. Based on our regression results in Table 5 Panel A, one standard deviation of change in the logarithm effective spread corresponds to –12.71%= –7.943*1.6% decrease in Tobin's Q ratio for REITs. In contrast, the corresponding change is –0.6%= –0.606*1% in Tobin's Q ratio for industrial firms based on Fang et al.'s (2009) results. Hence, the impact of liquidity on firm value

[15] The robust cluster variance estimator is robust to misspecification and within-cluster correlation. Petersen (2009) shows that OLS standard errors can be biased when the residuals are correlated across firms or across time. He finds that of the most common approaches used in the literature (including OLS, Fama-MacBeth, and Newey-West methods), only clustered standard errors are unbiased as they account for the residual dependence created by the firm effect. Further, Petersen (2009, p.437) shows that fixed effects or random effects models produce unbiased standard errors only when the firm effect is fixed (over time).

[16] In unreported results, we also include the property type dummies and year dummies in our regressions as robustness checks. The results are qualitatively similar to Table 5 with the same conclusion.

is more than 20 times larger for REITs than that for non-financial firms. This difference could potentially be attributable to the high information asymmetry and corporate governance problems in REITs. It further confirms that the REIT industry offers an important setting to test the economic effects of market liquidity on firm value.

Panel B of Table 5 provides further examination of the impact of market illiquidity on firm value based on decile ranked liquidity measures. Liquidity measures are ranked from 0 to 9 each year, and then the ranking is divided by 9 to obtain a decile ranking from 0 (lowest illiquidity) to 1 (highest illiquidity). This regression method is useful when illiquidity is time-varying and decreasing over time. Similar to the findings in Panel A using continuous illiquidity measures, Panel B documents the same qualitative results that the decile ranking of market illiquidity has a negative and significant impact on Q and ROA. For example, an increase from the lowest to the highest decile for the Amihud illiquidity measure implies an –0.421 change in Q. Together, our results in Panels A and B of Table 5 strongly support Hypothesis #1.

B. Impacts of Market Illiquidity on Firm Value with Different REIT Characteristics

If market liquidity can improve firm value as our findings above suggested, a follow-up question would be: Is the impact of market liquidity more pronounced for REIT firms that are subject to imperfect information and governance problems? The informational and monitoring impacts of market liquidity should be varying across different types of REITs and firm characteristics. Theoretically, firms with higher information asymmetry, or larger agency cost are

more likely to experience the benefits of market monitoring due to public trading. We expect the impact of market liquidity on firm value for these firms to be more significant.

Tables 6, 7, and 8 present our findings for stratified sub-samples based on three major characteristics of REITs of our interests, including: (i) Information Proxies (Table 6); (ii) Corporate Governance Proxies (Table 7); and (iii) Other Characteristics including REIT Types and Market Microstructure Effect (Table 8).[17]

First, to test for the information effect of market liquidity, Panels A and B of Table 6 show that the interaction effect between market illiquidity and idiosyncratic volatility and the interaction effect between market illiquidity and information asymmetry (proxied by no analyst following and no hedge fund ownership).[18] Each measure of market illiquidity has a significant and negative interaction coefficient on firm value (proxied by Tobin's Q or ROA). These findings reveal that market illiquidity has a significant and larger negative impact on Q for REITs with higher risk (proxied by idiosyncratic volatility) and for REITs with higher information asymmetry problems (proxied by no analyst following and no hedge fund ownership). These impacts are also economically significant. As shown in Panel A of Table 6, if illiquidity (log_amihud) increases from the lowest to the highest deciles, the change in Q is –0.281 for the *low* idiosyncratic volatility group. The corresponding change in Q is –0.475 = –0.281 – 0.194 for the *high* idiosyncratic volatility group (with –0.194 representing the interaction effect of illiquidity and *high* idiosyncratic volatility on firm value). Interestingly,

[17] Tables 6, 7, and 8 report the OLS regression results that are estimated with the Huber/White/Sandwich estimation of robust variance and clustered standard errors adjusted for intragroup correlation.

[18] As robustness test (results not reported here), we test the impact of market illiquidity on firm value for low analyst coverage and low hedge fund ownership and find similar results and same conclusion.

when we compare the Amihud interaction coefficients in Table 6 Panel A, the no hedge fund group has the most negative coefficient of –0.453, indicating that the liquidity impact on firm value is most significant for firms with no informed trading (from hedge fund). The results for ROA reported in Table 6 Panel B are qualitatively similar, but with lower significance level. These results are consistent with Hypothesis 2 that the illiquidity impact on performance should be higher for REITs with higher information asymmetry. They are also consistent with the stock price feedback effect of market liquidity, where firms with higher information asymmetry exhibit a greater impact of market liquidity on firm value (Fang et al., 2009).

Second, to test for the corporate governance effect of market liquidity, Panels A and B of Table 7 shows that market illiquidity has a significant and larger negative impact on Tobin's Q and ROA for REITs with poorer corporate governance, proxied by high leverage dummy and by CEO duality dummy (which equals to unity if the CEO is also the Chairman of the Board of directors, and zero otherwise). However, the interaction coefficients are insignificant. Hence, we do not find any direct evidence to support Hypothesis #3 that the liquidity impact on firm value is through the corporate governance channel among REITs.

Third, Table 8 shows that the impact of market liquidity on firm value (proxied by Tobin's Q and ROA) varies with REIT types and other characteristics. Consistent with Hypotheses #4A and #4B, Panels A and B of Table 8 show that market illiquidity has a larger negative impact on firm value for Cyclical REITs (compared to non-Cyclical REITs) and for Diversified REITs (compared to non-Diversified REITs). When we compare the Amihud interaction coefficients in Table 8 Panel A, the Diversified group has the most negative

coefficient of –0.400. This result indicates that the negative impact of illiquidity on firm value is most significant for Diversified REITs. For example, if illiquidity (log_amihud) increases from the lowest to the highest deciles, the change in Q is –0.358 for the *non-Diversified* REITs. The corresponding change in Q is –0.758 = –0.358 – 0.400 for *Diversified* REITs. This finding reveals that market illiquidity has a larger adverse impact on firm value for Diversified REITs, as diversification across property types exacerbates information asymmetry and agency problems. It is consistent with the argument by Capozza and Seguin (1999) that diversified REITs have lower value due to poorer liquidity associated with the exacerbation of the costs of information acquisition and information asymmetries. It further highlights the importance of market liquidity as a key economic driver in the relationships between diversification (focus) and firm value as Capozza and Seguin (1999) suggested.

Together, the findings in Tables 6 and 8 reveal that market illiquidity has a significant and larger negative impact on Q and ROA for REITs with higher information asymmetry and higher corporate governance problems. These findings support Hypotheses #2, #3, #4A and #4B. These findings also arrive at the same conclusion as Fang et al. (2009) that market liquidity is not merely a proxy for investor sentiment as Baker and Stein (2004) argued; rather, market liquidity has important value implications on firms.[19] Furthermore, our findings are among the first to uncover the information and governance effects of market liquidity on firm value for the REIT industry.

[19] We cannot adopt the same empirical approach used by Fang et al. (2009) for REITs because the accounting data for REITs is relatively sparse and not available to compute the variables required for their approach. However, our results provide complementary evidence to Fang et al. (2009).

Lastly, Table 8 shows that the impact of market liquidity on firm value can be driven by market structure of stock exchanges. Market illiquidity has a larger negative impact on firm value for REITs listed in the NYSE than those in AMEX or NASDAQ. This finding supports Hypothesis #5 and complements the finding by Cannon and Cole (2010) that liquidity improved the most for REITs traded on the NYSE, and was an order of magnitude better than liquidity of REITs traded on the AMEX or NASDAQ.[20] Further, our finding provides new evidence that favors floor-based trading structure (NYSE) over other trading structures (Huang and Stoll, 1996; Venkataraman, 2001).

C. Time-Varying Role of Market Illiquidity on Firm Value

As reported in Table 3, REIT market liquidity gyrates dramatically over time, as REIT market illiquidity is higher in the 1990s and much lowered in the past decade. And during the recent 2007 – 2009 subprime mortgage and financial crises, illiquidity increases significantly for most property types of REITs (except for Healthcare REITs). In Table 8, we report the time-variations in the impacts of market liquidity on firm value. We estimate a regression for each year in our sample to see whether the impact of market liquidity remains persistent over time, to gain further insights into the time-varying effect (if any) of market liquidity, and also to control for the any trend in this variable over time. Further, we examine impacts of liquidity during major events in the REIT industry and financial markets over time.

[20] For robustness check, we estimate our regressions by including the property type and year dummies. The unreported results are qualitatively the same.

The results in Table 9 (both Panels A and B) support the time-varying impacts of market liquidity on firm value. First, all measures of market illiquidity have significant impact on firm value for all years from 1992 to 2008 in our sample, confirming the persistency and significance of liquidity impact on the REIT industry over time.

Second, the time-varying impacts of liquidity are consistent with some major events in the REIT industry and financial markets. Although there is a relatively larger impact from 1993 to 1995, the impact is significantly reduced in early 2000s and before the subprime and financial crises started in 2006.[21] This pattern can also be explained by the Decimalization in 2001, the strengthened corporate governance and regulatory environment in the REIT industry over time [Zhu et al. (2010)], and the emergence of substitute governance mechanism such as the introduction of SOX since July 2002 that strengthens firms' internal control and disclosure requirement [Li, Pincus, and Rego (2008), Zhu et al. (2010)].

Third, illiquidity impact on future firm value is relatively larger during the down-market (e.g. 2008) and increases during the subprime and financial crises started in 2006. This finding suggests that during the subprime and financial crises, the role of public trading and market liquidity become more crucial for the survival and performance of REITs.

D. Endogeneity and Interrelationships between Liquidity and Firm Value

[21] Although Fang et al. (2009) argue that decimalization is an exogenous event in increasing the impact of market liquidity on firm value, our REIT evidence shows that the impact of market liquidity on firm value decreases after the decimalization in 2001.

As shown by Fang et al. (2009), different causative theories can explain the causal relations between market liquidity and firm value. While a negative relation between illiquidity and Q suggests that an improved liquidity helps to incorporate information and enhance performance, an alternative interpretation of this relation is that a high Q firm attracts liquidity traders (Chung, Elder, and Kim, 2010). To see whether high Q firms attract liquidity traders, we estimate the following using a simultaneous equation system of both market liquidity and firm value equations:

$$\begin{aligned} Q_{i,t+1} &= a_0 + a_1 * \log\_amihud_{it} + a_2 * Q_{it} + a_3 * SP500_{it} + a_4 * de_{it} + a_5 * \log\_age_{it} \\ &\quad + a_6 * \log\_at_{it} + a_7 * \log\_num_{it} + a_8 * mom_{it} + \varepsilon_{it} \end{aligned}$$

$$\begin{aligned} \log\_amihud_{i,t+1} &= b_0 + b_1 * Q_{it} + b_2 * \log\_amihud_{it} + b_3 * price_{i,t-1} + b_4 * sd_{i,t-1} \\ &\quad + b_5 * shrto_{i,t-1} + b_6 * \log\_mktcap_{i,t-1} + b_7 * ptype\_amihud_{i,t-1} + \varepsilon_{it} \end{aligned} \quad (5)$$

The selection of variables and the specification of the individual equations are based on previous work by others. Similar to Cannon and Cole (2010), we use stock price (*price*), return standard deviation (*sd*), share turnover (*shrto*), logarithm of market capitalization (*mktcap*), and value-weighted average log_amihud for REIT i's property type (*ptype-amihud*) as control variables (determinants) of market illiquidity measures. Equation (5) is estimated by two-stage least squares (2SLS) and three-stage least squares (3SLS) procedures.

Table 10 presents the simultaneous equation system of market liquidity and firm value. Panel A reports the results using 2SLS estimates and Panel B reports those with 3SLS estimates. The overall result reveals an interesting causal relationship between market liquidity and firm

value – market illiquidity has a significant and negative impact on firm value, yet higher firm value does not have a strong and significant impact on market liquidity. This finding addresses the potential reverse causality problem, and suggests that the main effect of market liquidity on firm value prevails.

As robustness check (results not reported here), we estimate the dynamic interrelationships between market liquidity and REIT firm value using Arellano-Bover/Blundell-Bond linear dynamic panel-data estimation. Two linear dynamic panel-data models are estimated by regressing: (i) One-year ahead Tobin's Q (q(1)) ratios on market liquidity (estimated as endogenous covariate), Tobin's Q and other control variables listed in equation (5) above; and (ii) One-year ahead Market liquidity on Tobin's Q ratios (estimated as endogenous covariate), market liquidity and other control variables listed in equation (5) above. The estimator is based on Arellano and Bover (1995), and Blundell and Bond (1998), with robust variance and unobserved panel-level effects. This result reveals that market liquidity mainly affects firm value (but not the reverse causal relation) in the setup of dynamic interrelationships between the two variables. The result confirms those in Table 10 that market illiquidity measures have a significant and negative impact on Tobin's Q; on the other hand, the impact of Tobin's Q on market illiquidity is found to be insignificant.

E. Impacts of Market Illiquidity on Pay-for-Performance Sensitivity

Table 11 reports the TOBIT regression results of PPS on liquidity using equation (4). Using the same method by Feng et al. (2010), we measure PPS as the Black-Scholes delta

multiplied by the number of most recent year options divided by shares outstanding at start of year.[22]

Table 11 shows that three out of four illiquidity measures (Amihud illiquidity, effective spread, quoted spread and percentage of zero volume days) have a significant and negative impact on 1-year ahead PPS (with the exception of percentage of zero volume day which is negative but insignificant). This finding supports our Hypothesis #6 that market illiquidity has a negative impact on PPS, and suggests that a liquid equity market can create more informed trading and ultimately makes managerial compensation more responsive to informative prices. It further suggests that market liquidity can enhance firm performance by improving the efficiency of managerial incentives contracts.

Further analysis (results not reported here) shows that the estimated impact of market illiquidity on PPS remains significant with similar effect even after controlling for institutional ownership (a key explanatory variable for PPS used by Feng et al. (2010)) in equation (4). This result further reveals that market liquidity is a significant driver of PPS through different channels such as informed trading and managerial incentives.

In essence, our result in Table 11 is important in its own right as it documents the impact of market liquidity on managerial compensations in the REIT industry. First, our finding from

[22] As reported in Table 1, our estimates of PPS has a mean of $0.56 and a standard deviation of 1.735; our estimated PPS is lower than those reported by Feng et al. (2010), possibly due to differences in sample sizes and data sources. Our sample is based on available data from SNL database while Feng et al. construct the data from both SNL and hand-collected proxy statements and they include REITs with institutional ownership information for 10 consecutive years over the period 1998–2007.

the REIT industry is consistent with the empirical finding from other (non-financial) industries by Fang et al. (2009) that an increase in liquidity can ultimately create a higher PPS and hence better managerial incentives. Second, our finding supports the existing theories (e.g., Holmstrom and Tirole, 1993; Faure-Grimaud and Gromb, 2004) that market liquidity can incentivize managers to engage in value enhancing activities and create more efficient managerial contracts that are based on the firm's performance. Third, the responsiveness of managerial compensation to market liquidity highlights the importance of liquidity in facilitating: (i) informed trading that incentivizes managers (Kang and Liu, 2010) and (ii) informative stock prices that enhance corporate decisions and performance (Khanna and Sonti, 2004; Ferreira and Laux, 2007). Lastly, existing literature, such as Maug (1998) and Noe (2002), suggests that market liquidity can support effective corporate governance through monitoring activities. Our finding provides further evidence of the corporate governance channel, namely managerial incentives, in which market liquidity can improve corporate governance and firm value.

VI. Conclusion

Market microstructure has profound economic impact on firm value and performance (O'Hara, 1999; Easley and O'Hara, 2004), as market liquidity can improve corporate governance through informative prices (Diamond and Verrecchia, 1981; Holmstrom and Tirole, 1993), monitoring (Kyle and Vila, 1991; Kahn and Winton, 1998; Maug, 1998; Noe, 2002) and managerial incentives (Faure-Grimaud and Gromb, 2004). However, there is no comprehensive empirical evidence on how market microstructure and liquidity affect firm value in REITs. This

study is among the first to provide evidence on how REIT market liquidity can improve the firm value and performances of REITs through informational and corporate governance effects.

Using a sample of REITs in US from 1992 to 2008, we find that different measures of market illiquidity have a significant and negative impact on future firm performance (Tobin's Q and ROA). The impact of market illiquidity on firm value is more economically significant for Cyclical REITs, and for REITs with higher idiosyncratic risk, with no analyst coverage, and with no hedge fund equity ownership. These findings are consistent with the asymmetry information theory that market liquidity stimulates trades by informed investors, resulting in more informative stock prices and ultimately higher firm value. Further, we also find the impact of market illiquidity on firm value is more significant for Diversified REITs than other REITs, and that liquidity enhances CEO's PPS. These findings are consistent with the corporate governance theory that the monitoring effect of market liquidity is more important for REITs with moral hazard problems, and that market liquidity improves managerial incentives and contracting efficiency.

In addition to the above, our findings have several important practical implications for the REIT industry and managers. Due to its information, incentives, and corporate governance effects, market liquidity should be an important dimension of firm performance metrics, and hence an important consideration in designing corporate and financial policies. From a corporate finance perspective, REITs that are illiquid are those that are opaque and subject to severe asymmetric information; as such, REITs that encounter valuation and financing issues should look for possibilities of enhancing market trading and liquidity, such as improving the firm's

disclosure policies (Heflin, Shaw, and Wild, 2005). From a corporate governance perspective, REITs (such as Diversified REITs) that are prone to agency and corporate governance problems should experience greater benefits from an increase in market liquidity which lowers the costs of information acquisition and monitoring. Most prominently, REITs should attend to market liquidity and consider underlying stock trading characteristics to improve managerial incentives and contracting efficiency. Finally, our findings support the broader insights that market liquidity is not only a metaphor from financial markets but also has material effects on corporate activities and real economy (Naes, Skjeltorp and Ødegaard, 2010). Corporate decisions, and institutional regulations aimed at enhancing the trading and well-functioning of equity markets will help shape the future prospect of the REIT industry.

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Table 1. Summary Statistics

This table reports the summary statistics and correlations among key variables for our REIT sample of 1879 firm-year observations, from 1992-2008, and for 212 REITs. Tobin's Q (q(1)) ratio is defined as the 1-year ahead market value of assets (the market value of equity +book value of assets – book value of equity – balance sheet deferred taxes), divided by the book value of assets. Return on Assets (ROA(1)) is defined as the 1-year ahead earnings before interest, taxes and depreciation, divided by total assets. Pay-for-Performance-Sensitivity (PPS(1)) is defined as the 1-year ahead Black-Scholes delta multiplied by 1000, and by the number of most recent year options divided by shares outstanding at start of year. The logarithm of Amihud illiquidity (log_amihud), the logarithm of volume-weighted quoted spread (log_vwqs), the logarithm of volume-weighted effective spread (log_vwes), and the logarithm of the percentage of zero volume days (log_pzvd) are the illiquidity measures of the firm. SP500 dummy equals to unity if the firm is a member of the S&P500 firms, and zero otherwise. Delaware (de) equals to unity if the firm is incorporated in Delaware, and zero otherwise. Age (log_age) is the logarithm of the firm's age. Firm size (log_at) is the logarithm of the firm's total asset. Analysts (log_num) is the log of one plus the number of analyst earnings estimates. Momentum (mom) is the 6-month market excess returns starting Jan. of the year.

	Mean	median	sd	Spearman Correlation											
Variable				**q(1)**	**ROA(1)**	**PPS(1)**	**log_amihud**	**log_vwqs**	**log_vwes**	**log_pzvd**	**sp500**	**de**	**log_age**	**log_at**	**log_num**
q(1)	1.245	1.196	0.343												
ROA(1)	0.060	0.064	0.046	0.539***											
PPS(1)	0.563	0.000	1.735	0.012	0.047										
log_amihud	0.247	0.011	0.632	-0.521***	-0.328***	-0.049									
log_vwqs	0.020	0.013	0.025	-0.505***	-0.292***	0.206***	0.775***								
log_vwes	0.010	0.005	0.016	-0.517***	-0.307***	0.045	0.777***	0.768***							
log_pzvd	0.037	0.000	0.106	-0.422***	-0.417***	-0.158***	0.671***	0.502***	0.536***						
sp500	0.154	0.000	0.361	0.242***	0.119**	-0.216***	-0.457***	-0.522***	-0.436***	-0.196***					
de	0.088	0.000	0.284	0.114***	-0.019	-0.011	-0.086***	-0.029	-0.063***	0.008	0.018				
log_age	2.304	2.303	0.667	0.140***	0.015	-0.130***	-0.074***	-0.194***	-0.049**	0.112***	0.128***	0.069***			
log_at	6.408	6.502	1.460	0.287***	0.162***	0.072**	-0.865***	-0.639***	-0.615***	-0.610***	0.387***	0.100***	0.102***		
log_num	0.239	0.000	0.446	0.285***	0.215***	-0.055	-0.463***	-0.470***	-0.327***	-0.254***	0.313***	0.055**	0.123***	0.401***	
mom	0.031	0.016	0.192	-0.203***	0.032	-0.206***	0.039*	-0.119**	-0.033	0.027	0.063***	-0.014	0.074**	0.105**	0.088***

***, **, * indicate 1%, 5%, and 10% significance levels, respectively, for statistical significance of coefficients.

Table 2. Summary Statistics by Property Type

This table reports the summary statistics for our REIT sample for each Property type. Our sample consists of 1879 firm-year observations, from 1992-2008, and for 212 REITs. Tobin's Q (q(1)) ratio is defined as the 1-year ahead market value of assets (the market value of equity +book value of assets – book value of equity – balance sheet deferred taxes), divided by the book value of assets. Return on Assets (ROA(1)) is defined as the 1-year ahead earnings before interest, taxes and depreciation, divided by total assets. The logarithm of Amihud illiquidity (log_amihud), the logarithm of volume-weighted quoted spread (log_vwqs), the logarithm of volume-weighted effective spread (log_vwes), and the logarithm of the percentage of zero volume days (log_pzvd) are the illiquidity measures of the firm.

Property Type	Statistics	q(1)	ROA(1)	log_amihud	log_vwqs	log_vwes	log_pzvd	N
Diversified	mean	1.220	0.044	0.026	0.015	0.088	0.441	258
	median	1.132	0.045	0.018	0.008	0.000	0.059	
	st. dev.	0.464	0.058	0.030	0.020	0.162	0.686	
Healthcare	mean	1.407	0.103	0.014	0.006	0.002	0.046	174
	median	1.360	0.109	0.011	0.005	0.000	0.008	
	st. dev.	0.398	0.032	0.015	0.005	0.010	0.126	
Industrial / Office	mean	1.145	0.049	0.026	0.014	0.057	0.465	443
	median	1.133	0.049	0.013	0.004	0.000	0.007	
	st. dev.	0.277	0.042	0.035	0.023	0.130	0.963	
Residential	mean	1.266	0.064	0.015	0.006	0.024	0.112	267
	median	1.245	0.061	0.012	0.004	0.000	0.008	
	st. dev.	0.212	0.031	0.014	0.007	0.078	0.354	
Resorts	mean	1.090	0.069	0.011	0.007	0.001	0.045	73
	median	1.068	0.066	0.006	0.006	0.000	0.009	
	st. dev.	0.202	0.011	0.011	0.005	0.010	0.147	
Retail	mean	1.302	0.064	0.018	0.008	0.017	0.131	495
	median	1.236	0.066	0.014	0.005	0.000	0.016	
	st. dev.	0.342	0.036	0.019	0.010	0.069	0.394	
Storage	mean	1.257	0.073	0.013	0.007	0.034	0.164	54
	median	1.222	0.073	0.014	0.005	0.000	0.010	
	st. dev.	0.303	0.022	0.009	0.004	0.082	0.261	

Table 3. Median Statistics on Tobin's Q and Illiquidity, by Property Type and by Year

This table shows the median statistics for Tobin's Q ratios and for the logarithm of Amihud illiquidity for the REITs for each property type across years. Tobin's Q (q(1)) ratio is defined as the 1-year ahead market value of assets (the market value of equity + book value of assets – book value of equity – balance sheet deferred taxes), divided by the book value of assets. The logarithm of Amihud illiquidity (log_amihud) measures the stock's illiquidity.

	Diversified		Healthcare		Industrial/Office		Resorts		Residential		Retail		Storage	
Year	q(1)	log_ amihud	q(1)	log_ amihud	q(1)	log_ amihud	q(1)	log_ amihud	q(1)	log_ amihud	q(1)	log_ amihud	q(1)	log_ amihud
1992	0.88	0.9432	1.46	0.0147	0.63	2.0491			1.34	0.1554	1.18	0.1651	0.79	0.3891
1993	0.97	0.4210	1.66	0.0264	0.69	1.7960			1.23	0.1612	1.28	0.1246	0.86	0.5217
1994	1.06	0.5103	1.46	0.0257	0.79	1.4843			1.18	0.0404	1.18	0.0856	1.13	0.4736
1995	1.00	0.0839	1.31	0.0120	0.93	1.2434			1.24	0.0226	1.17	0.0482	1.09	0.3899
1996	1.04	0.0973	1.35	0.0114	1.16	0.0329	1.29	0.0232	1.21	0.0190	1.16	0.0250	1.31	0.2384
1997	1.15	0.0534	1.45	0.0061	1.32	0.0112	1.36	0.0118	1.32	0.0097	1.27	0.0207	1.45	0.0090
1998	1.20	0.0281	1.41	0.0076	1.29	0.0080	1.21	0.0101	1.25	0.0103	1.26	0.0188	1.41	0.0107
1999	1.08	0.0405	1.26	0.0102	1.06	0.0090	0.89	0.0090	1.10	0.0104	1.13	0.0188	1.12	0.0085
2000	1.10	0.0744	0.94	0.0457	1.04	0.0075	0.86	0.0210	1.11	0.0120	1.06	0.0263	1.09	0.0112
2001	1.10	0.0612	0.86	0.0435	1.12	0.0042	0.93	0.0222	1.19	0.0053	1.06	0.0178	1.06	0.0044
2002	1.15	0.0248	1.11	0.0112	1.14	0.0033	0.93	0.0362	1.22	0.0043	1.19	0.0093	1.30	0.0039
2003	1.16	0.0054	1.20	0.0071	1.13	0.0020	0.90	0.0284	1.11	0.0031	1.23	0.0027	1.26	0.0036
2004	1.17	0.0040	1.41	0.0051	1.23	0.0016	1.05	0.0123	1.24	0.0034	1.39	0.0026	1.51	0.0026
2005	1.18	0.0030	1.54	0.0037	1.30	0.0011	1.30	0.0066	1.33	0.0011	1.49	0.0018	1.71	0.0018
2006	1.13	0.0017	1.46	0.0024	1.28	0.0009	1.12	0.0032	1.42	0.0007	1.45	0.0019	1.46	0.0022
2007	1.16	0.0021	1.59	0.0023	1.45	0.0007	1.22	0.0013	1.57	0.0007	1.63	0.0022	1.49	0.0021
2008	1.08	0.0065	1.48	0.0023	1.18	0.0015	1.08	0.0077	1.32	0.0011	1.43	0.0032	1.22	0.0036

Table 4. Tobin's Q and Amihud Illiquidity - Examples

This table shows the Tobin's Q ratios and the logarithm of Amihud illiquidity for the REITs with the largest total assets as of the year of 2008, and for each property type. Tobin's Q (q(1)) ratio is defined as the 1-year ahead market value of assets (the market value of equity +book value of assets – book value of equity – balance sheet deferred taxes), divided by the book value of assets. The logarithm of Amihud (log_amihud) measures the stock's illiquidity. Total asset is the book value asset as of 2008. Growth is the 10-year growth rate in total asset from 1999-2008.

Property type	**Diversified**		**Healthcare**		**Ind/Office**		**Residential**		**Resorts**		**Retail**		**Storage**	
Company Name	General Growth Properties		H C P Inc		Prologis		Equity Residential		Hospitality Properties Trust		Simon Property Group		Public Storage	
Total Asset in 2008 ($B)	25.24		10.01		15.90		15.06		3.96		22.08		11.20	
Growth (times)	13		12		5		4		4		4		4	
Year	q(1)	Log_ amihud	q(1)	Log_ amihud	q(1)	Log_ amihud	q(1)	Log_ amihud	q(1)	Log_ amihud	q(1)	Log_ amihud	q(1)	Log_ amihud
1999	1.22	0.0034	1.40	0.0047	1.23	0.0032	0.96	0.0027	1.08	0.0008	1.16	0.0019	1.32	0.0027
2000	1.10	0.0023	1.12	0.0041	1.15	0.0019	0.83	0.0043	1.11	0.0006	1.09	0.0014	1.12	0.0030
2001	1.18	0.0013	1.27	0.0017	1.24	0.0016	0.94	0.0021	1.24	0.0004	1.12	0.0008	1.13	0.0014
2002	1.22	0.0007	1.44	0.0010	1.27	0.0007	1.13	0.0013	1.27	0.0004	1.20	0.0003	1.37	0.0010
2003	1.28	0.0005	1.46	0.0010	1.34	0.0006	1.30	0.0010	1.20	0.0004	1.25	0.0003	1.34	0.0012
2004	1.45	0.0005	1.72	0.0012	1.50	0.0005	1.40	0.0010	1.34	0.0003	1.41	0.0002	1.64	0.0008
2005	1.19	0.0003	1.83	0.0009	1.75	0.0002	1.55	0.0007	1.46	0.0002	1.48	0.0001	1.93	0.0004
2006	1.32	0.0002	1.66	0.0008	1.47	0.0002	1.36	0.0007	1.46	0.0001	1.65	0.0001	2.14	0.0002
2007	1.38	0.0002	1.43	0.0004	1.57	0.0001	1.44	0.0004	1.62	0.0002	1.88	0.0001	1.99	0.0002
2008		0.0025	1.30	0.0003	1.46	0.0005	1.11	0.0012	1.32	0.0002	1.70	0.0001	1.68	0.0002

Table 5. Regression Results of Firm Value on Illiquidity Measures

This table reports the regression results of Tobin's Q (q(1)) ratios and Return on assets (ROA(1)) on market illiquidity measures, focusing on the main effect. Our sample consists of 1879 firm-year observations, from 1992-2008, and for 212 REITs. Tobin's Q (q(1)) ratio is defined as the 1-year ahead market value of assets (the market value of equity +book value of assets – book value of equity – balance sheet deferred taxes), divided by the book value of assets. Return on Assets (ROA(1)) is defined as the 1-year ahead earnings before interest, taxes and depreciation, divided by total assets. The logarithm of Amihud illiquidity (log_amihud), the logarithm of volume-weighted quoted spread (log_vwqs), the logarithm of volume-weighted effective spread (log_vwes), and the logarithm of the percentage of zero volume days (log_pzvd) are the illiquidity measures of the firm. Amrk, qsrk, esrk, zvrk are decile rankings within each year for log_amihud, log_vwqs, log_vwes, and log_pzvd, respectively. Illiquidity measures are ranked from 0 to 9 each year, and then the ranking is divided by 9 to obtain a decile ranking from 0 to 1. SP500 dummy equals to unity if the firm is a member of the S&P500 firms. Delaware (de) equals to unity if the firm is incorporated in Delaware. Age (log_age) is the logarithm of the firm's age. Firm size (log_at) is the logarithm of the firm's total asset. Analyst (log_num) is the log of one plus the number of analyst earnings estimates. Momentum (mom) is the 6-month market excess returns starting Jan. of the year.

Panel A. Raw Illiquidity Measures

	Dependent variable = q(1)				**Dependent variable = ROA(1)**			
sp500	0.090***	0.043*	0.069***	0.096***	0.009	0.005	0.006	0.011
	(0.022)	(0.023)	(0.023)	(0.022)	(0.009)	(0.009)	(0.009)	(0.008)
de	0.126	0.136	0.120	0.175*	-0.017	-0.012	-0.014	-0.007
	(0.112)	(0.116)	(0.119)	(0.103)	(0.019)	(0.019)	(0.019)	(0.014)
log_age	0.115***	0.089***	0.101***	0.118***	0.002	-0.002	-0.001	0.006
	(0.034)	(0.032)	(0.034)	(0.034)	(0.006)	(0.006)	(0.006)	(0.005)
log_at	-0.023	-0.016	-0.007	-0.021	-0.004	-0.002	-0.001	-0.006**
	(0.017)	(0.017)	(0.018)	(0.016)	(0.003)	(0.003)	(0.003)	(0.003)
log_num	0.106***	0.075***	0.105***	0.107***	0.024**	0.024**	0.026**	0.022**
	(0.027)	(0.027)	(0.027)	(0.027)	(0.009)	(0.010)	(0.010)	(0.009)
mom	-0.399***	-0.465***	-0.411***	-0.393***	0.009	0.006	0.010	0.009
	(0.035)	(0.036)	(0.035)	(0.037)	(0.008)	(0.009)	(0.008)	(0.008)
log_amihud	-0.224***				-0.020***			
	(0.034)				(0.005)			
log_vwqs		-5.901***				-0.410***		
		(0.684)				(0.102)		
log_vwes			-7.943***				-0.538***	
			(1.170)				(0.168)	
log_pzvd				-1.210***				-0.127***
				(0.220)				(0.029)
Intercept	1.142***	1.235***	1.101***	1.108***	0.090***	0.084***	0.076***	0.090***
	(0.088)	(0.098)	(0.092)	(0.090)	(0.017)	(0.018)	(0.017)	(0.018)
Adj_Rsq	0.284	0.296	0.269	0.263	0.163	0.119	0.111	0.175
N	1764	1761	1761	1764	433	431	431	433

Table 5 (continued)

Panel B. Decile Ranked Illiquidity Measures

	Dependent variable = q(1)				Dependent variable = ROA(1)			
sp500	0.101***	0.084***	0.088***	0.091***	0.008	0.007	0.004	0.008
	(0.023)	(0.024)	(0.024)	(0.023)	(0.008)	(0.009)	(0.008)	(0.008)
de	0.086	0.104	0.100	0.155	-0.013	-0.010	-0.011	-0.009
	(0.125)	(0.119)	(0.118)	(0.122)	(0.016)	(0.017)	(0.017)	(0.016)
log_age	0.107***	0.098***	0.106***	0.120***	0.002	-0.000	-0.001	0.007
	(0.034)	(0.031)	(0.032)	(0.034)	(0.005)	(0.005)	(0.005)	(0.005)
log_at	-0.028	-0.003	-0.005	-0.028	-0.004*	-0.001	-0.000	-0.008***
	(0.018)	(0.015)	(0.015)	(0.018)	(0.002)	(0.002)	(0.002)	(0.003)
log_num	0.087***	0.089***	0.087***	0.099***	0.017**	0.019**	0.020**	0.018**
	(0.025)	(0.025)	(0.025)	(0.027)	(0.008)	(0.009)	(0.009)	(0.009)
mom	-0.390***	-0.423***	-0.420***	-0.387***	0.009	0.010	0.009	0.011
	(0.036)	(0.033)	(0.033)	(0.040)	(0.008)	(0.009)	(0.009)	(0.008)
amrk	-0.421***				-0.056***			
	(0.069)				(0.012)			
qsrk		-0.378***				-0.046***		
		(0.046)				(0.008)		
esrk			-0.407***				-0.043***	
			(0.048)				(0.009)	
zvrk				-0.378***				-0.057***
				(0.077)				(0.009)
Intercept	1.346***	1.191***	1.203***	1.167***	0.109***	0.088***	0.087***	0.106***
	(0.113)	(0.080)	(0.078)	(0.107)	(0.015)	(0.014)	(0.015)	(0.016)
Adj_Rsq	0.261	0.274	0.289	0.259	0.161	0.150	0.137	0.206
N	1764	1761	1761	1764	433	431	431	433

Standard errors adjusted for clustered standard error and robust variance are reported in parentheses. ***, **, * indicate 1%, 5%, and 10% significance levels, respectively, for statistical significance of coefficients.

Table 6. Regression Results of Firm Value on Illiquidity and Information Proxies

This table reports the regression results of Tobin's Q (q(1)) ratios and Return on assets (ROA(1)) on market illiquidity measures, including the interaction effect. Our sample consists of 1879 firm-year observations, from 1992-2008, and for 212 REITs. Tobin's Q (q(1)) ratio is defined as the 1-year ahead market value of assets (the market value of equity +book value of assets – book value of equity – balance sheet deferred taxes), divided by the book value of assets. Return on Assets (ROA(1)) is defined as the 1-year ahead earnings before interest, taxes and depreciation, divided by total assets. Amrk, qsrk, esrk, zvrk are decile rankings within each year for Amihud illiquidity, the volume-weighted quoted spread, the volume-weighted effective spread, and the percentage of zero volume days, respectively. Residual standard deviation is estimated from the market model using monthly stock returns over the preceding 5-year period. High sigma dummy equals to unity if the residual standard deviation is higher than the median for that year, and zero otherwise. No analyst dummy equals to unity if there are no analysts giving earnings forecasts for the firm, and zero otherwise. No hedge fund dummy equals to unity if there is no hedge fund equity ownership in the firm for the year, and zero otherwise. (Note that coefficients for control variables are omitted).

Panel A. Tobin's Q (q(1)) as Dependent Variable

	Dependent variable = q(1)											
	X = High Sigma				**X = No Analyst**				**X = No Hedge fund**			
X	0.021	0.030	0.060	-0.079***	-0.013	-0.023	0.001	-0.099***	0.207***	0.200***	0.208***	0.039*
	(0.046)	(0.046)	(0.047)	(0.028)	(0.038)	(0.041)	(0.042)	(0.025)	(0.037)	(0.035)	(0.036)	(0.022)
amrk	-0.281***				-0.255***				-0.109			
	(0.076)				(0.079)				(0.077)			
X*amrk	-0.194**				-0.216***				-0.453***			
	(0.084)				(0.069)				(0.075)			
qsrk		-0.252***				-0.245***				-0.094*		
		(0.056)				(0.070)				(0.049)		
X*qsrk		-0.189**				-0.171**				-0.417***		
		(0.075)				(0.070)				(0.071)		
esrk			-0.255***				-0.233***				-0.107**	
			(0.063)				(0.062)				(0.053)	
X*esrk			-0.234***				-0.226***				-0.431***	
			(0.082)				(0.070)				(0.069)	
zvrk				-0.294***				-0.339***				-0.159
				(0.069)				(0.124)				(0.099)
X*zvrk				-0.071				-0.039				-0.252***
				(0.078)				(0.133)				(0.080)
Intercept	1.317***	1.176***	1.173***	1.202***	1.387***	1.239***	1.238***	1.264***	1.207***	1.045***	1.052***	1.137***
	(0.111)	(0.082)	(0.079)	(0.106)	(0.134)	(0.102)	(0.098)	(0.122)	(0.117)	(0.092)	(0.090)	(0.115)
Adj_Rsq	0.277	0.287	0.304	0.274	0.268	0.278	0.296	0.258	0.297	0.306	0.322	0.265
N	1764	1761	1761	1764	1764	1761	1761	1764	1764	1761	1761	1764

Table 6 (continued)

Panel B. Return on Assets (ROA(1)) as Dependent Variable

	Dependent variable = ROA(1)											
	X = High Sigma				X = No Analyst				X = No Hedge fund			
X	0.019*	-0.003	-0.003	0.001	-0.010	-0.006	-0.013	-0.015**	0.027**	0.024**	0.023**	0.008
	(0.011)	(0.011)	(0.011)	(0.007)	(0.011)	(0.011)	(0.011)	(0.006)	(0.011)	(0.010)	(0.011)	(0.007)
amrk	-0.010				-0.041				-0.014			
	(0.016)				(0.034)				(0.018)			
X*amrk	-0.061***				-0.018				-0.053***			
	(0.020)				(0.031)				(0.020)			
qsrk		-0.026***				-0.023				-0.011		
		(0.009)				(0.022)				(0.013)		
X*qsrk		-0.020				-0.027				-0.043**		
		(0.015)				(0.024)				(0.018)		
esrk			-0.021**				-0.035*				-0.012	
			(0.010)				(0.019)				(0.012)	
X*esrk			-0.021				-0.010				-0.038**	
			(0.015)				(0.022)				(0.017)	
zvrk				-0.023*				-0.036				-0.051***
				(0.012)				(0.033)				(0.012)
X*zvrk				-0.039**				-0.022				-0.008
				(0.016)				(0.034)				(0.013)
Intercept	0.096***	0.087***	0.084***	0.105***	0.121***	0.099***	0.102***	0.121***	0.086***	0.067***	0.065***	0.097***
	(0.015)	(0.014)	(0.014)	(0.015)	(0.022)	(0.019)	(0.020)	(0.020)	(0.021)	(0.020)	(0.021)	(0.021)
Adj_Rsq	0.201	0.165	0.153	0.226	0.158	0.149	0.130	0.198	0.179	0.161	0.143	0.205
N	433	431	431	433	433	431	431	433	433	431	431	433

Standard errors adjusted for clustered standard error and robust variance are reported in parentheses. ***, **, * indicate 1%, 5%, and 10% significance levels, respectively, for statistical significance of coefficients.

Table 7. Regression Results of Firm Value on Illiquidity and Corporate Governance Proxies

This table reports the regression results of Tobin's Q (q(1)) ratios and Return on assets (ROA(1)) on market illiquidity measures, including the interaction effect. Our sample consists of 1879 firm-year observations, from 1992-2008, and for 212 REITs. Tobin's Q (q(1)) ratio is defined as the 1-year ahead market value of assets (the market value of equity +book value of assets – book value of equity – balance sheet deferred taxes), divided by the book value of assets. Return on Assets (ROA(1)) is defined as the 1-year ahead earnings before interest, taxes and depreciation, divided by total assets. Amrk, qsrk, esrk, zvrk are decile rankings within each year for Amihud illiquidity, the volume-weighted quoted spread, the volume-weighted effective spread, and the percentage of zero volume days, respectively. High leverage dummy equals to unity if the firm has leverage (total debt divided by total assets) above the median for the year, and zero otherwise. CEO_Duality dummy equals to unity if the CEO is also the Chairman of the Board of directors, and zero otherwise. (Note that coefficients for control variables are omitted)

Panel A. Tobin's Q (q(1)) as Dependent Variable

	Dependent variable = q(1)							
	X = High Leverage				**X = CEO_Duality**			
X	0.079	0.081*	0.073	0.035	0.055	0.073	0.048	0.063*
	(0.051)	(0.045)	(0.046)	(0.032)	(0.051)	(0.045)	(0.045)	(0.032)
amrk	-0.437***				-0.259***			
	(0.086)				(0.081)			
X*amrk	-0.020				0.007			
	(0.103)				(0.102)			
qsrk		-0.388***				-0.173***		
		(0.064)				(0.053)		
X*qsrk		-0.022				-0.029		
		(0.076)				(0.075)		
esrk			-0.412***				-0.206***	
			(0.061)				(0.051)	
X*esrk			-0.019				0.028	
			(0.077)				(0.087)	
zvrk				-0.504***				-0.157**
				(0.098)				(0.076)
X*zvrk				0.165				-0.155*
				(0.109)				(0.091)
Intercept	1.351***	1.183***	1.192***	1.199***	1.298***	1.080***	1.094***	0.977***
	(0.111)	(0.083)	(0.081)	(0.103)	(0.172)	(0.108)	(0.109)	(0.116)
Adj_Rsq	0.269	0.283	0.296	0.272	0.283	0.287	0.286	0.291
N	1764	1761	1761	1764	902	902	902	902

Table 7 (continued)

Panel B. Return on Assets (ROA(1)) as Dependent Variable

	Dependent variable = ROA(1)							
	X = High Leverage				X = CEO_Duality			
X	-0.002	-0.010	-0.014	-0.000	0.019**	0.018**	0.023**	0.019***
	(0.013)	(0.011)	(0.012)	(0.007)	(0.009)	(0.008)	(0.009)	(0.007)
amrk	-0.062***				-0.011			
	(0.019)				(0.022)			
X*amrk	0.009				0.002			
	(0.022)				(0.019)			
qsrk		-0.057***				-0.019		
		(0.011)				(0.014)		
X*qsrk		0.020				0.003		
		(0.016)				(0.014)		
esrk			-0.056***				-0.008	
			(0.009)				(0.015)	
X*esrk			0.023				-0.006	
			(0.017)				(0.016)	
zvrk				-0.082***				-0.009
				(0.013)				(0.019)
X*zvrk				0.031**				-0.001
				(0.013)				(0.013)
Intercept	0.114***	0.096***	0.095***	0.120***	0.103**	0.113***	0.100***	0.095***
	(0.020)	(0.015)	(0.015)	(0.017)	(0.049)	(0.029)	(0.033)	(0.030)
Adj_Rsq	0.159	0.152	0.139	0.235	0.124	0.151	0.132	0.125
N	433	431	431	433	105	105	105	105

Standard errors adjusted for clustered standard error and robust variance are reported in parentheses. ***, **, * indicate 1%, 5%, and 10% significance levels, respectively, for statistical significance of coefficients.

Table 8. Regression Results of Firm Value on Illiquidity and REIT Types

This table reports the regression results of Tobin's Q (q(1)) ratios and Return on assets (ROA(1)) on market illiquidity measures, including the interaction effect. Our sample consists of 1879 firm-year observations, from 1992-2008, and for 212 REITs. Tobin's Q (q(1)) ratio is defined as the 1-year ahead market value of assets (the market value of equity +book value of assets – book value of equity – balance sheet deferred taxes), divided by the book value of assets. Return on Assets (ROA(1)) is defined as the 1-year ahead earnings before interest, taxes and depreciation, divided by total assets. Amrk, qsrk, esrk, zvrk are decile rankings within each year for Amihud illiquidity, the volume-weighted quoted spread, the volume-weighted effective spread, and the percentage of zero volume days, respectively. Cyclical dummy equals to unity if the REIT does not belong to Residential or Healthcare, and zero otherwise. Diversified dummy equals to unity if the REIT belongs to Diversified REITs and zero otherwise. NYSE dummy equals to unity if the REIT is listed on the New York Stock Exchange, and zero otherwise. (Note that coefficients on control variables are not shown)

Panel A. Tobin's Q (q(1)) as Dependent Variable

	Dependent variable = q(1)											
	X = Cyclical				X = Diversified				X = NYSE			
X	0.049	0.032	0.018	-0.054	0.209	0.171	0.169	0.036	0.313**	0.267***	0.426***	0.249***
	(0.065)	(0.063)	(0.060)	(0.040)	(0.154)	(0.130)	(0.130)	(0.086)	(0.139)	(0.087)	(0.108)	(0.056)
amrk	-0.206**				-0.358***				-0.270			
	(0.096)				(0.067)				(0.175)			
X*amrk	-0.283**				-0.400**				-0.086			
	(0.113)				(0.201)				(0.185)			
qsrk		-0.189***				-0.319***				-0.277**		
		(0.067)				(0.040)				(0.109)		
X*qsrk		-0.249***				-0.362**				-0.047		
		(0.088)				(0.160)				(0.114)		
esrk			-0.248***				-0.347***				-0.097	
			(0.060)				(0.042)				(0.114)	
X*esrk			-0.203**				-0.353**				-0.265**	
			(0.084)				(0.157)				(0.121)	
zvrk				-0.216***				-0.310***				-0.222**
				(0.068)				(0.081)				(0.086)
X*zvrk				-0.178**				-0.243				-0.091
				(0.078)				(0.150)				(0.133)
Intercept	1.326***	1.183***	1.200***	1.199***	1.316***	1.169***	1.180***	1.149***	1.154***	1.065***	0.904***	1.004***
	(0.123)	(0.094)	(0.088)	(0.112)	(0.116)	(0.080)	(0.078)	(0.109)	(0.153)	(0.102)	(0.117)	(0.094)
Adj_Rsq	0.280	0.293	0.303	0.269	0.277	0.290	0.304	0.269	0.300	0.310	0.320	0.284
N	1764	1761	1761	1764	1764	1761	1761	1764	1764	1761	1761	1764

Table 8 (continued)

Panel B. Return on Assets (ROA(1)) as Dependent Variable

	Dependent variable = ROA(1)											
	X = Cyclical				X = Diversified				X = NYSE			
X	0.011	-0.013	-0.016	-0.014	0.010	-0.005	-0.003	-0.005	0.002	0.042**	0.052***	0.013
	(0.018)	(0.015)	(0.016)	(0.010)	(0.015)	(0.016)	(0.016)	(0.011)	(0.036)	(0.018)	(0.019)	(0.019)
amrk	0.009				-0.040***				-0.062			
	(0.029)				(0.014)				(0.039)			
X*amrk	-0.078**				-0.036				0.016			
	(0.031)				(0.022)				(0.043)			
qsrk		-0.023				-0.038***				-0.009		
		(0.019)				(0.008)				(0.020)		
X*qsrk		-0.025				-0.018				-0.036		
		(0.023)				(0.020)				(0.022)		
esrk			-0.027				-0.034***				0.002	
			(0.020)				(0.010)				(0.019)	
X*esrk			-0.014				-0.021				-0.046**	
			(0.024)				(0.020)				(0.022)	
zvrk				-0.024				-0.049***				-0.048**
				(0.032)				(0.010)				(0.021)
X*zvrk				-0.028				-0.015				-0.006
				(0.034)				(0.018)				(0.023)
Intercept	0.108***	0.101***	0.098***	0.112***	0.099***	0.084***	0.082***	0.101***	0.114***	0.063***	0.054**	0.099***
	(0.019)	(0.016)	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)	(0.017)	(0.035)	(0.022)	(0.022)	(0.023)
Adj_Rsq	0.241	0.196	0.170	0.222	0.186	0.172	0.160	0.218	0.172	0.168	0.160	0.207
N	433	431	431	433	433	431	431	433	433	431	431	433

Standard errors adjusted for clustered standard error and robust variance are reported in parentheses. ***, **, * indicate 1%, 5%, and 10% significance levels, respectively, for statistical significance of coefficients.

Table 9. Regression Results of Tobin's Q on Illiquidity– by Year

This table reports the regression results of Tobin's Q (q(1)) ratios on market illiquidity measures, by year. Our sample consists of 1879 firm-year observations, from 1992-2008, and for 212 REITs. Tobin's Q (q(1)) ratio is defined as the 1-year ahead market value of assets (the market value of equity +book value of assets – book value of equity – balance sheet deferred taxes), divided by the book value of assets. The logarithm of the Amihud illiquidity (log_amihud) is the illiquidity measure of the firm. Amrk is the decile rankings within each year for log_amihud. (Note that coefficients for control variables are omitted)

Panel A. Raw Log_amihud Measure

	Dependent variable = q(1)								
Year	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
log_amihud	-0.162**	-0.225***	-0.232***	-0.214***	-0.141*	-0.109	-0.427***	-0.238***	-0.197***
	(0.064)	(0.041)	(0.044)	(0.061)	(0.081)	(0.113)	(0.114)	(0.089)	(0.067)
Intercept	1.301***	1.316***	0.869***	0.586**	0.812***	0.685***	1.022***	1.137***	1.256***
	(0.425)	(0.362)	(0.244)	(0.237)	(0.218)	(0.185)	(0.184)	(0.150)	(0.201)
Adj_Rsq	0.348	0.394	0.362	0.277	0.191	0.099	0.269	0.278	0.132
N	63	66	71	86	125	120	118	123	128

	Dependent variable = q(1)							
Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
log_amihud	-0.238***	-0.165**	-0.143*	-0.159*	-0.231***	-0.240***	-0.267***	-0.312***
	(0.075)	(0.078)	(0.077)	(0.085)	(0.075)	(0.081)	(0.092)	(0.079)
Intercept	1.364***	1.117***	1.013***	0.910***	1.217***	1.106***	1.065***	1.394***
	(0.190)	(0.160)	(0.192)	(0.187)	(0.222)	(0.211)	(0.272)	(0.240)
Adj_Rsq	0.302	0.111	0.073	0.136	0.226	0.223	0.226	0.219
N	123	118	112	109	103	101	101	97

Table 9 (continued)

Panel B. Decile Rank Amrk Measure

	Dependent variable = q(1)								
Year	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
amrk	-0.891***	-1.174***	-1.077***	-0.972***	-0.653***	-0.475***	-0.223**	-0.093	-0.340***
	(0.228)	(0.167)	(0.203)	(0.194)	(0.121)	(0.143)	(0.111)	(0.106)	(0.129)
Intercept	1.792***	1.919***	1.648***	1.705***	1.679***	1.336***	0.901***	0.945***	1.586***
	(0.448)	(0.351)	(0.312)	(0.330)	(0.268)	(0.259)	(0.267)	(0.277)	(0.350)
Adj_Rsq	0.442	0.527	0.477	0.388	0.309	0.172	0.165	0.175	0.082
N	63	66	71	86	125	120	118	123	128

	Dependent variable = q(1)							
Year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
amrk	-0.457***	-0.455***	-0.544***	-0.460***	-0.440*	-0.559***	-0.622**	-0.758***
	(0.105)	(0.099)	(0.096)	(0.138)	(0.232)	(0.207)	(0.237)	(0.151)
Intercept	1.804***	1.791***	1.944***	1.643***	1.864***	1.994***	2.000***	2.412***
	(0.245)	(0.258)	(0.284)	(0.357)	(0.513)	(0.463)	(0.600)	(0.434)
Adj_Rsq	0.277	0.149	0.182	0.178	0.199	0.244	0.212	0.273
N	123	118	112	109	103	101	101	97

Standard errors adjusted for clustered standard error and robust variance are reported in parentheses. ***, **, * indicate 1%, 5%, and 10% significance levels, respectively, for statistical significance of coefficients.

Table 10. Simultaneous Equation System of Market Illiquidity and Firm Value

This table reports the simultaneous equation system of market illiquidity and Tobin's Q (q(1)). Our sample consists of 1879 firm-year observations, from 1992-2008, and for 212 REITs. Panel A reports the results using 2SLS estimates and Panel B reports those with 3SLS estimates. Tobin's Q (q(1)) ratio is defined as the 1-year ahead market value of assets (the market value of equity +book value of assets – book value of equity – balance sheet deferred taxes), divided by the book value of assets. Amihud illiquidity (log_amihud) is the illiquidity measure of the firm. SP500 dummy equals to unity if the firm is a member of the S&P500 firms, and zero otherwise. Delaware (de) equals to unity if the firm is incorporated in Delaware, and zero otherwise. Age (log_age) is the logarithm of the firm's age. Firm size (log_at) is the logarithm of the firm's total asset. Analyst (log_num) is the log of one plus the number of analyst earnings estimates. Momentum (mom) is the 6-month market excess returns starting Jan. of the year. Stock Price (price) is the fiscal-year end stock price. Standard deviation of stock return (sd) is the standard deviation of daily stock return. Share turnover (shrto) is measured as the shares traded for the year, divided by number of shares outstanding. Market capitalization (log_mktcap) is the logarithm of market capitalization. Property-type Amihud illiquidity (ptype_amihud) is the value-weighted average log_amihud for REIT i's property type.

Panel A. 2SLS

Dependent Variable = q(1)		Dependent Variable = log_amihud(1)	
log_amihud	-0.204***	q	0.000
	(0.02)		(0.01)
q	0.139***	log_amihud	0.981***
	(0.01)		(0.01)
sp500	0.034	price	-0.000
	(0.02)		0.00
de	0.114***	sd	-0.550*
	(0.03)		(0.32)
log_age	0.112***	shrto	-0.01
	(0.01)		(0.01)
log_at	-0.013*	log_mktcap	-0.000
	(0.01)		(0.01)
log_num	0.100***	ptype_amihud	-0.158***
	(0.02)		(0.03)
mom	-0.412***	Intercept	0.051*
	(0.04)		(0.03)
Intercept	0.907***		
	(0.06)		
R-squared	0.3423	R-squared	0.9019
F-Test	96.73***	F-Test	1953.96***
N	1496	N	1496

Table 10 (continued)

Panel B. 3SLS

Dependent Variable = q(1)		Dependent Variable = log_amihud(1)	
log_amihud	-0.204***	q	-0.001
	(0.02)		(0.01)
q	0.138***	log_amihud	0.983***
	(0.01)		(0.01)
sp500	0.034	price	0.000
	(0.02)		0.00
de	0.115***	sd	-0.536*
	(0.03)		(0.32)
log_age	0.113***	shrto	-0.012
	(0.01)		(0.01)
log_at	-0.013*	log_mktcap	0.001
	(0.01)		(0.01)
log_num	0.100***	ptype_amihud	-0.158***
	(0.02)		(0.03)
mom	-0.421***	Intercept	0.044
	(0.04)		(0.03)
Intercept	0.907***		
	(0.06)		
R-squared	0.3423	R-squared	0.9019
Chi-square	784.11***	Chi-square	13751.71***
N	1496	N	1496

Standard errors are reported in parentheses. ***, **, * indicate 1%, 5%, and 10% significance levels, respectively, for statistical significance of coefficients.

Table 11. TOBIT Regression Results of Pay-for-Performance-Sensitivity

This table reports the TOBIT regression results of the 1-year ahead Pay-for-Performance-Sensitivity (PPS(1)) on market illiquidity. Our sample consists of 1879 firm-year observations, from 1992-2008, and for 212 REITs. Pay-for-Performance Sensitivity is defined as the Black-Scholes delta multiplied by 1000, and by the number of most recent year options divided by shares outstanding at start of year. Amrk, qsrk, esrk, zvrk are decile rankings within each year for Amihud illiquidity, the volume-weighted quoted spread, the volume-weighted effective spread, and the percentage of zero volume days, respectively. CEO_Duality equals to unity if the CEO is also the Chairman of the Board of Directors, and zero otherwise. Leverage (lev) is total debt divided by total asset. Market Capitalization (log_mktcap) is the logarithm of the firm's market capitalization.

	Dependent variable = PPS(1)			
CEO_Duality	0.314	0.347	0.395	0.437
	(0.286)	(0.287)	(0.288)	(0.288)
q	0.021	-0.016	-0.022	-0.011
	(0.141)	(0.148)	(0.149)	(0.149)
log_mktcap	-0.567***	0.021	0.090	0.167
	(0.209)	(0.138)	(0.138)	(0.138)
lev	-2.553***	-2.504***	-2.546***	-2.661***
	(0.914)	(0.907)	(0.913)	(0.916)
amrk	-4.370***			
	(0.957)			
qsrk		-1.830***		
		(0.607)		
esrk			-1.424**	
			(0.626)	
zvrk				-0.982
				(0.744)
Intercept	5.785***	0.925	0.296	-0.695
	(1.887)	(1.334)	(1.331)	(1.235)
Pseudo rsq	0.030	0.023	0.020	0.018
N	712	712	712	712

Standard errors are reported in parentheses. ***, **, * indicate 1%, 5%, and 10% significance levels, respectively, for statistical significance of coefficients.