

Changes in REIT Liquidity: Evidence from Daily Data 1988 – 2007

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Abstract:

In this study, we present new panel-data evidence on REIT liquidity and its determinants over the 1988 – 2007 period. We focus upon liquidity measures that do not require micro-structure data (1) to facilitate use of our results as benchmarks for comparisons with results from international markets for which micro-structure data may be unavailable, (2) to provide benchmarks that do not require access to costly (and voluminous) micro-structure data.

We find that REIT liquidity deteriorated during the late 1990s but improved dramatically during 2000 – 2006, with the notable exception of 2007. 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. We link the deterioration in liquidity observed in 2007 to the investment portfolio of a REIT. We find that the percentage bid-ask spread is highly correlated with the measure of price impact proposed by Amihud (2002).

We provide panel-data evidence on the key determinants of the percentage bid-ask spread that largely confirms the results reported by Bhasin, Cole and Kiely (1997) for 1990 and 1994: the percentage spread is a positive function of the volatility of stock returns, and a negative function of dollar volume turnover, share price and market capitalization.

Finally, we provide evidence that these results obtained using daily closing bid- and ask-prices are not qualitatively different from those obtained using market micro-structure data. This suggests that we can use liquidity measures based upon readily available daily return data rather than being forced to rely upon market micro-structure data.

JEL Classifications: G12, G21, G23, G29

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1. Introduction

When U.S. Real Estate Investment Trusts (“REITs”) were first created during the 1970s, they were viewed as a tax-preferred mechanism enabling the retail investor to own a share of a diversified real-estate portfolio. Following commercial real estate debacle in the late 1980s, REITs were “re-discovered” as a mechanism enabling institutional investors to hold real estate in their portfolios and obtain relatively high dividend yields while maintaining the ability to exit their investment at will without requiring a sale of the underlying real estate assets. The liquidity of REIT investments relative to alternatives, such as separate accounts and commingled real estate funds, had great appeal to these investors, and led to tremendous change in the REIT industry during the past two decades. Market capitalization has grown from \$11 billion in 1987 to \$141 billion in 1997 and \$312 billion in 2007. However, the 2007 figure is down by more than 25% from its high of \$438 billion in 2006. Institutional investors played a pivotal role in this growth, with institutional ownership of equity REITs accounting for 76 percent of all outstanding shares as of October 2008 (Source: SNL Securities).

The number of REITs has grown from 110 in 1987 to a high of 226 in 1994 and then fallen to 152 as of year-end 2007. Most REITs acquire and manage real estate (“equity REITs”), but REITs that either issue their own loans or purchase secondary market securities (“mortgage REITs”) exist, as well. Equity REITs have come to dominate the industry. In 1987, equity REITs accounted for slightly less than half of both the number and market cap of the industry. By 1997, equity REITs accounted for more than 90 percent of the industry market cap, and that percentage has remained around this

level through today. By 1997, equity REITs accounted for three out of every four REITs; this percentage also has remained around this level through today.

Mortgage REITs have seen their fortunes rise and fall during the past two decades. The market cap of mortgage REITs reached what was then a high of \$3.6B in 1987, then declined in the early 1990s to a low of \$2.5B in 1994 before rising again during the late 1990s to a high of \$7.4B in 1997. Their market cap fell to a low of \$1.6B in 2000 and then rose to an all-time high of \$29B in 2006 before dropping to \$19B in 2007.

In view of these seismic changes in the industry, this seems like a propitious time to revisit the issue of REIT liquidity. If REITs were attractive because of their liquidity, have the improvements in REIT liquidity documented by researchers for the early 1990s continued into the late 1990s and on into the 21st century, paralleling the increase in the industry's market capitalization? How has REIT liquidity changed in response to the housing bubble and subsequently emerging subprime crisis and credit crunch?

In this study, we shed new light on these important issues by presenting new evidence on REIT liquidity and its determinants over the 1988 – 2007 period. Our panel data, covering 337 REITs over 20 years, enable us to be the first to employ panel-data techniques in exploring the determinants of REIT liquidity.

We focus upon liquidity measures that do not require micro-structure data (1) to facilitate use of our results as benchmarks for comparisons with results from international markets for which micro-structure data may be unavailable, (2) to provide benchmarks that do not require access to costly (and voluminous) micro-structure data.

We find that REIT liquidity deteriorated during the late 1990s, but rebounded dramatically during 2000 – 2006, but declined again during 2007. Liquidity improved most for REITs traded on the NYSE, and was an order of magnitude better than the liquidity of REITs traded on the AMEX or NASDAQ. We link the deterioration in liquidity observed in 2007 to the investment portfolio of a REIT.

We also find that the percentage bid-ask spread is highly correlated with the measure of price impact proposed by Amihud (2002). The percentage spread has been criticized by some academics as only a measure of inventory costs; our finding strongly refutes this criticism, at least for REITs.

We provide panel-data evidence on the key determinants of the percentage bid-ask spread that largely confirms the results reported by Bhasin, Cole and Kiely (1997) for 1990 and 1994—the percentage spread is a positive function of the volatility of stock returns, and a negative function of dollar-volume turnover, share price and market capitalization.

Finally, we provide evidence that these results obtained using daily closing bid- and ask-prices are not qualitatively different from those obtained using market micro-structure data. This finding suggests that we can use liquidity measures based upon readily available daily-return data rather than being forced to rely upon difficult-to-obtain market micro-structure data.

2. Literature Review

The literature on stock market liquidity dates back at least to Demsetz (1968), but we focus only on studies that examine the liquidity of REITs. For good survey articles of stock market liquidity, see O'Hara (1995), Madhavan (2000), and Biais, Glosten and Spatt (2005).

Nelling *et al.* (1995) were the first to examine REIT liquidity. They analyze daily closing bid-ask spreads primarily for NASDAQ firms over the late 1980s. They find that REIT liquidity as measured by the percentage spread declined during the 1980s, i.e., percentage spreads widened, making REIT shares relatively expensive.

Below, Kiely and McIntosh (1996) use market-microstructure data from 1991 to examine the intraday-trading behavior of REITs. They find that REITs have lower volume and fewer trades than non-REITs, and that mortgage REITs trade at narrower spreads than equity REITs. They also find that REITs with higher institutional ownership trade at narrower spreads that are closer to those observed for non-REITS.

Bhasin, Cole and Kiely (1997) also use market micro-structure data to examine REIT liquidity. They analyze TAQ data from 1990 and 1994 and find that percentage bid-ask spreads declined significantly over that period—a time when there was significant growth in the number and market capitalization of REITs. They also use an empirical model of the spread developed by Stoll (1978) to provide evidence on the determinants of the spread. They confirm, for REITS, the basic results reported by Stoll—that liquidity is a positive function of the price and dollar volume, and a negative function of the volatility of stock returns.

Cole (1998) reexamines the 1990 and 1994 data used by Bhasin, Cole and Kiely (1997). He finds that the improvements in liquidity reported by Bhasin, Cole and Kiely are attributable to the “new REITs” that went public during 1991 – 1993 and were larger, higher priced, and traded with more volume than REITs existing in 1990. When he looks only at REITs that existed during both periods, he finds that REIT liquidity for these firms actually declined.

Clayton and MacKinnon (2000) use intraday data from 1993 and 1996 to decompose the percentage spread into three components, as suggested by the model developed by Kyle (1985)—the cost of liquidating a position quickly (“tightness”), the ability to liquidate a large position without materially affecting price (“depth”), and the ability of a stock’s price to recover quickly from a random market shock (“resiliency”). Like Bhasin, Cole and Kiely (1997), they find strong evidence that liquidity increased during the early 1990s, even when using a matched sample. This finding contrasts with those of Cole (1998) but most of the “new REITs” in Cole’s study began trading in 1992. Clayton and MacKinnon’s decomposition of the spread suggests that most of the improvement in liquidity was attributable to improvements in depth rather than tightness.

Benveniste, Capozza and Seguin (2001) use data on REITS from 1985 – 1992 to analyze the relation between liquidity and market value. Comparing the replacement value of assets held by a REIT to the value of the REIT itself, they find that securitization through the REIT structure increases the value of the underlying real estate assets by 10 – 20 percent. They also analyze cross-sectional determinants of liquidity as measured by dollar volume, and find that the market value of equity explains almost half the variation

in dollar volume, but that the statistical significance of this relation disappears when they include control variables for institutional ownership and property focus.

Danielson and Harrison (2002) examine how private information affects the liquidity of REITs. They find that NYSE and AMEX REITs are significantly more liquid than NASDAQ REITs and that REITs holding more transparent portfolios trade at narrower spreads.

Marcato and Ward (2007) develop a model for decomposing REIT liquidity into the three components suggested by the model of Kyle (1985), but, unlike Clayton and MacKinnon (2000), they use data on daily stock returns rather than market microstructure data. Marcato and Ward seek to establish that the results reported by Clayton and MacKinnon intraday data can be approximated by their model using daily data. Marcato and Ward find that many of the results reported by Clayton and MacKinnon can, indeed, be approximated by their model using daily data.

3. Data and Methodology

3.1 Data

Our data come primarily from two sources: CRSP and Compustat. From CRSP, we obtain daily data from 1988 – 2007 on exchange listing, price, volume, returns and shares outstanding for all firms with standard industrial classification 6798. We also obtain closing bid and ask prices from 1993 – 2007 as NYSE and AMEX data on bids and asks became available in late December of 2002. From Compustat, we obtain annual data from 1988 – 2007 on total assets, total debt, total liabilities, and equity investments

in real estate. We then merge our data from CRSP and Compustat by cusip and year to obtain our final sample 3,415 firm-year observations on 337 REITs over 20 years.

Table 1 shows the number of REITs in our sample by year and exchange. The total number of REITs ranges from a low of 95 in 1988 to a high of 213 in 1994. The number of NYSE REITs ranges from a low of 33 in 1988 to a high of 159 in 1998, while the number of AMEX (NASDAQ) REITs ranges from a low of 17 (6) in 2007 (2007) to a high of 57 (31) in 1994 (1988).

3.2 Methodology

3.2.1 Measuring Liquidity

We calculate three alternative measures of liquidity based upon daily stock-price data—the percentage bid-ask spread, the dollar volume, and the price impact as proposed by Amihud (2002).

The *Percentage Bid-Ask Spread* is calculated as:

$$\text{Percentage Spread}_{i,t} = (\text{Bid}_{i,t} - \text{Ask}_{i,t}) / [(\text{Bid}_{i,t} + \text{Ask}_{i,t}) / 2] \quad (1)$$

The percentage spread is the most widely used measure of liquidity, but has been criticized by some academics as measuring only the “tightness” component of liquidity. Lower values indicate greater liquidity.

The *Dollar Volume* is calculated as:

$$\text{Dollar Volume}_{i,t} = \text{Volume}_{i,t} \times \text{Price}_{i,t} \quad (2)$$

The dollar volume has been used by Benveniste, Capozza, Seguin (2001) and others to capture the “depth” component of liquidity. Higher values of dollar volume indicate greater market depth and greater liquidity.

The *Price Impact* measure of liquidity was originally proposed by Amihud (2002), and is closely related to another measure of liquidity known as the *Amivest Measure*, which is the ratio of the sum of daily volume to the sum of the absolute return, and was used by Berkman and Eleswarapu (1998) and Amihud *et al.* (1997). The *Price Impact* for stock *i* on day *t* is calculated as:

$$\text{Price Impact}_{i,t} = \text{ABS}(\text{Return}_{i,t}) / \text{Dollar Volume}_{i,t} \quad (3)$$

Where *ABS* indicates the absolute value, *Return*_{*i,t*} is the daily return on stock *i* for day *t*; and *Dollar Volume*_{*i,t*} is as defined above. The advantage of the *Price Impact* over the *Amivest* measure is the ease of its interpretation—the price impact is simply the change in share price per dollar of volume. Like the *Dollar Volume*, the *Price Impact* is primarily a measure of the “depth” component of liquidity. Lower values of *Price Impact* indicate more depth and liquidity.

For each measure of liquidity, we first calculate its value on a daily basis for each REIT. Next, we calculate annual averages for each REIT. We then use these annual averages by REIT to calculate annual measures of liquidity for the industry so that we can track changes in liquidity over time.

3.22 Explaining the Percentage Spread

We use an empirical model of the percentage spread developed by Stoll (1978) and used by Chiang and Venkatesh (1988) and Bhasin, Cole and Kiely (1997). Market makers incur three types of costs: *fixed costs*, *inventory costs*, and *adverse-information costs*. In Stoll's model, fixed costs are proxied by share price; inventory costs are proxied by volatility as measured by the standard deviation of returns; and adverse information costs are proxied by turnover, as measured by dollar volume divided by market cap.

We also include size (as measured by market capitalization) because Chiang and Venkatesh (1988) and Nelling *et al.* (1995) find this variable to be a significant determinant of spreads. We include exchange dummies because Kadlec and McConnell (1994) find that changing from an AMEX or NASDAQ listing to a NYSE listing reduces a stock's spread. Our model is as follows:

Percentage Bid-Ask Spread_{i,t} =

F (Price, Standard Deviation of Returns, Turnover, Market Cap, AMEX, NASDAQ) (4)

We transform all continuous variables into natural logarithms. We summarize our expectations regarding the relation between liquidity and our explanatory variables below:

<u>Variable</u>	<u>Expected Sign</u>
ln (Share Price)	-
ln (Std. Dev of Returns)	+
ln (Turnover)	-
ln (Market Cap)	-
AMEX, NASD	+

4. Results

4.1 Percentage Bid-Ask Spreads By Year and Exchange

In column 2 of Table 2, we present median annual REIT percentage bid-ask spreads over the period 1993 – 2007.¹ For all REITs, the spread rose from 1.91 percent in 1993 to 2.45 percent in 1995 and a high of 2.86 percent in 1999, in contrast to the results reported by Bhasin, Cole and Kiely (1997) and Clayton and McKinnon (2000) for the early 1990s. In fact, our results contradict those reported by Clayton and McKinnon, who compared liquidity in 1993 and 1996, and report that percentage spreads declined. We do not have data for 1990 except for NASDAQ firms, so we cannot make direct comparisons with Bhasin, Cole and Kiely (1997). However, from 1999 through 2006, we find dramatic declines in the percentage spread—from 2.86 percent in 1999 to 0.16 percent in 2006 before rising again in 2007 to 0.19 percent.

In columns 3 – 5 of Table 2, we present median annual REIT percentage spreads by exchange listing: NYSE, AMEX or NASDAQ. The spreads of NYSE firms are lower than those of firms on either the AMEX or NASDAQ in each year except for 2000. In most years, these differences are massive; in 2006, for example, the 0.13 percentage spread is about one fourth that of AMEX REITs and one-third of NASDAQ REITs. For 2003 – 2007, the percentage spreads of AMEX and NASDAQ REITs are at least double those of NYSE REITs.

¹ CRSP does not report closing bid- and ask-prices prior to December 2002. We do obtain data from NASDAQ firms from 1988 – 2002 and those results are available from the authors upon request.

4.2 Dollar Volume by Year and Exchange

In column 2 of Table 3, we present the median annual daily dollar volume (in millions) over the period 1988 – 2008. Median annual daily dollar volume fluctuated from less than 0.1 million during 1988 – 1992, then more than doubled to .22 million in 1993. It remained less than 1 million until 1997 when it jumped to 1.17 million before declining to 0.65 million in 2000. Over the subsequent eight years, volume spiked upward in each year to a peak of 8.63 million in 2007, a more than twelve-fold increase in this measure of liquidity.

In columns 3 – 5 of Table 3, we explore the changes in dollar volume by exchange listing. In this table, we see that the huge increases in dollar volume were limited to NYSE firms, which rose from 1.1 million in 1999 to 15.1 million in 2007. In contrast, NASDAQ REITs rose over the same period only from 0.14 million to a high of 0.39 million in 2005 and AMEX REITs rose from only 0.09 million to a high of 0.17 in 2005. REIT liquidity as measured by dollar volume did increase for AMEX and NASDAQ REITs during the past twenty years, but not by nearly so much as NYSE REITs.

4.3 Price Impact by Year and Exchange

In column 2 of Table 4, we present the median annual price impact over the 1988 – 2007 period. After jumping from around 0.5 in 1988 and 1989 to 1.14 in 1990, the price impact declined to 0.8 in 1992 before plummeting to 0.16 in 1993. During 1994 – 1997, the price impact continued to decline to a low of 0.01 before rising to 0.03 in 2000. From

2001 – 2007, the price impact resumed its decline, signaling greater market depth, to a low of 0.002 in both 2006 and 2007.

In columns 3 – 5 of Table 4, we explore changes in the price impact by exchange listing. Most striking in these columns are the wide differences across exchanges. In 1988, the Price Impact is 1.759 for NASDAQ REITs, 0.583 for AMEX REITs but only 0.139 for NYSE REITs. AMEX REITs do not reach the 1988 level of Price Impact for NYSE REITs until 2005; NASDAQ REITs until 2004. However, the Price Impact of NYSE REITs had dropped to a miniscule 0.004 in 2004 and 2005. Thus, liquidity as measured by the Price Impact remained roughly five times greater for NYSE REITs than for AMEX or NASDAQ REITs pretty much throughout the last two decades.

4.4 Correlations of Liquidity Measures

In Table 5, we present the Pearson product-moment correlation coefficients calculated over the 1988 – 2007 period for each of our three annual measures of liquidity: the *Percentage Spread*, the *Dollar Volume* and the *Price Impact*. We find statistically significant and numerically large correlations between the *Percentage Spread* and both the *Price Impact* (+0.64) and the *Dollar Volume* (-0.11)—each of which is a measure of market depth. The percentage spread has been criticized by some academics such as Brennan and Subrahmanyam (1996) as only measuring the “tightness” of the market. Our results strongly refute this criticism—at least for REITs. We also find a negative and significant correlation between the *Price Impact* and *Dollar Volume*. What is surprising is that the Price Impact is far more highly correlated with the *Percentage Spread* than with the *Dollar Volume*.

4.5 Determinants of Percentage Bid-Ask Spread

In Table 6, we present descriptive statistics for the variables that we use in Stoll's empirical model of the percentage spread. The mean percentage spread is 2.7 percent, the mean dollar volume is \$3.54 million and the mean price impact is 0.74. The average share price is \$19.03, the average dollar turnover is 3.6 and the average market cap is \$726 million. The average standard deviation of returns (volatility) is 0.0207.

In Tables 7 and 8, we present the results from estimating eq. (4), where we use Stoll's empirical model of the percentage spread to explore determinants of REIT spreads. First, we estimate the model without any fixed effects and then we estimate the model with time fixed effects (annual year dummies for each year).

4.51 No Time Fixed Effects

In Table 7, we present the results from estimating eq. (4) without time fixed effects. Our results show that these six variables account for more than sixty percent of the variability in our dependent variable (adjusted R-square = 0.61). Each of the explanatory variables has the expected sign, except for the two exchange dummies.

Percentage spreads are narrower when share prices are higher, when turnover is higher and when market capitalization is higher. Percentage spreads are wider when return volatility is higher.

Both AMEX and NASD are negative and highly significant, indicating that percentage spreads are narrower on those exchanges relative to those on the NYSE, but only *after* controlling for the other four explanatory variables.

4.52 Time Fixed Effects Included

In Table 8, we present the results from re-estimating eq. (4) including a set of annual time dummies for each year except 2006. This means that our results are measured relative to 2006, when REIT percentage spreads hit their minimum. The results for the explanatory variables appearing in Table 7 are qualitatively unchanged by the inclusion of the year fixed effects, but the explanatory power of the model as measured by the adjusted R-square, jumps from 0.62 to 0.91. Also of interest are the year fixed effects. Each of these coefficients is positive and highly statistically significant. The magnitude mirror the year-by-year differences in percentage spreads that can be calculated from the yearly spreads appearing in Table 2. Spreads jumped around during the 1990s, but, beginning in 1999, narrowed in each year through 2006, before rising sharply in 2007, just at the subprime mortgage crisis came to the forefront.

4.6 Equity Real-Estate Investments and REIT Liquidity

In Table 9, we present the coefficients from re-estimating eq. (4) on a year-by-year basis from 2001 – 2007 with one additional variable—the percentage of equity investments in real estate as a percentage of total assets. Unfortunately, this variable is not available for earlier years. For brevity, we only present the coefficient on the real-estate variable. The real estate variable is positive throughout the 2002-2004 period, indicating that percentage spreads are wider when firms held more equity investments in real estate, but that this relation switched signs in 2006-2007. These results are consistent with the story that, in the early part of the decade, investors viewed equity real estate investments as more opaque than the primary alternative REIT asset—mortgage-backed

securities; but, as the subprime mortgage crisis emerged, investors changed their perceptions in favor of equity real estate investments and against MBS investments.

4.7 Comparison with Bhasin Cole and Kiely (1997)

In Table 10, we estimate eq. (4) for 1994 only in order to compare our results with those reported by Bhasin, Cole and Kiely (1997) (“BCK”) using intraday market microstructure data from 1994. We are unable to make comparisons with the BCK results for 1990 because daily bid- and ask-prices are not available for NYSE or AMEX firms prior to 1993. Our sample is significantly smaller than that of BCK (224 versus 337), but the explanatory power of the two models is very similar (adjusted Rsquares of 0.93 versus 0.89). Each variable that is statistically significant in BCK’s model also is statistically significant in our model and each has the same sign across the two models. This suggests that percentage bid-ask spread measured using daily closing spreads make reasonable proxies for percentage bid-ask spreads measured using intra-day market micro-structure data.

5. Summary and Conclusions

In this study, we present new evidence on REIT liquidity and its determinants over the 1988-2007 period. We focus upon three liquidity measures that do not require micro-structure data: the percentage bid-ask spread, the dollar volume and the price impact measure proposed by Amihud (2002).

We find that REIT liquidity deteriorated during the late 1990s but improved dramatically during 2000 – 2006, with the notable exception of 2007. 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. We link the deterioration in liquidity observed in 2007 to the investment portfolio of a REIT.

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Table 1:
Number of REITs
By Year and Exchange Listing

Year	Total	NYSE	AMEX	NASD
1988	95	33	30	31
1989	108	42	35	31
1990	108	43	36	29
1991	127	47	53	27
1992	131	53	53	25
1993	176	94	57	27
1994	213	127	57	29
1995	205	129	48	27
1996	195	136	35	24
1997	206	155	28	23
1998	210	159	28	23
1999	202	151	30	21
2000	191	148	24	19
2001	183	139	29	16
2002	177	136	28	13
2003	178	138	26	14
2004	193	159	21	13
2005	193	160	21	11
2006	171	142	19	10
2007	153	130	17	6

Table 2
Median Percentage Bid-Ask Spreads
By Year and Exchange Listing

	Obs.	ALL	NYSE	AMEX	NASD
1988	28	N/A	N/A	N/A	4.99%
1989	29	N/A	N/A	N/A	4.88%
1990	26	N/A	N/A	N/A	7.22%
1991	23	N/A	N/A	N/A	7.45%
1992	27	N/A	N/A	N/A	7.42%
1993	180	1.91%	1.29%	2.40%	6.87%
1994	224	1.80%	1.33%	2.32%	5.22%
1995	226	2.45%	2.30%	2.48%	5.01%
1996	223	2.18%	2.04%	2.28%	4.01%
1997	225	1.83%	1.63%	2.84%	4.61%
1998	228	2.25%	1.95%	4.36%	3.21%
1999	216	2.86%	2.50%	5.08%	2.47%
2000	206	2.50%	2.25%	5.47%	2.11%
2001	196	1.34%	1.22%	2.32%	1.79%
2002	190	0.94%	0.87%	1.53%	2.46%
2003	191	0.40%	0.38%	1.17%	1.28%
2004	206	0.21%	0.18%	0.94%	0.70%
2005	208	0.22%	0.18%	0.76%	0.43%
2006	204	0.16%	0.13%	0.64%	0.49%
2007	182	0.19%	0.18%	1.00%	0.49%

Table 3:
Dollar Volume (\$ Millions)
By Year and Exchange Listing

	Obs.	ALL	NYSE	AMEX	NASD
1988	113	0.062	0.13	0.04	0.02
1989	116	0.066	0.13	0.03	0.02
1990	114	0.033	0.10	0.02	0.01
1991	133	0.025	0.13	0.02	0.01
1992	136	0.026	0.21	0.02	0.01
1993	180	0.217	1.15	0.02	0.04
1994	224	0.349	0.68	0.02	0.05
1995	226	0.319	0.59	0.02	0.04
1996	223	0.597	0.92	0.03	0.11
1997	225	1.177	1.41	0.09	0.06
1998	228	1.024	1.43	0.12	0.12
1999	216	0.805	1.10	0.09	0.14
2000	206	0.648	0.97	0.06	0.15
2001	196	0.934	1.66	0.05	0.19
2002	190	1.543	2.79	0.06	0.07
2003	191	2.301	3.26	0.11	0.14
2004	206	3.294	4.63	0.04	0.34
2005	208	3.598	4.44	0.17	0.39
2006	204	5.139	7.76	0.13	0.20
2007	182	8.632	15.08	0.12	0.26

Table 4:
Median Annual Price Impact
By Year and Exchange Listing

YEAR	Obs.	ALL	NYSE	AMEX	NASD
1988	113	0.493	0.139	0.583	1.759
1989	116	0.487	0.149	0.830	1.446
1990	114	1.145	0.213	2.184	2.953
1991	133	1.030	0.172	1.210	2.646
1992	136	0.829	0.118	1.345	2.255
1993	180	0.163	0.025	0.803	2.160
1994	224	0.093	0.030	1.190	1.184
1995	226	0.070	0.031	0.933	0.851
1996	223	0.032	0.017	0.507	0.925
1997	225	0.014	0.010	0.187	1.279
1998	228	0.019	0.012	0.352	0.477
1999	216	0.022	0.014	0.572	0.622
2000	206	0.032	0.015	0.585	0.434
2001	196	0.019	0.009	0.706	0.384
2002	190	0.009	0.005	0.298	1.967
2003	191	0.006	0.003	0.208	0.527
2004	206	0.004	0.003	0.569	0.074
2005	208	0.004	0.003	0.136	0.056
2006	204	0.002	0.002	0.121	0.118
2007	182	0.002	0.001	0.177	0.091

Table 5
Correlation Coefficients between Liquidity Measures
Prob > |r| under H0: Rho=0
Number of Observations

		Percentage Spread	Price Impact	Dollar Volume
Percentage Spread	Correlation	1.00		
	P-Value			
	Observations	3,345		
Price Impact	Correlation	0.64	1.00	
	P-Value	<.0001		
	Observations	3,344	3,714	
Dollar Volume	Correlation	-0.11	-0.09	1.00
	P-Value	<.0001	<.0001	
	Observations	3,345	3,714	3,717

Table 6
Descriptive Statistics

Variable	Obs.	Median	Mean	Standard Error	Min.	Max
Percentage Bid-Ask Spread	3,070	0.016	0.027	0.001	0.000	0.878
Dollar Volume (\$M)	3,415	0.700	3.541	0.172	0.000	174
Price Impact	3,414	0.028	0.743	0.028	0.000	12.00
Share Price	3,415	15.85	19.03	0.29	0.08	397.51
Standard Deviation of Returns	3,414	0.0153	0.0207	0.0003	0.0000	0.4558
Dollar Turnover	3,415	2.5	3.6	0.1	0.0	226.9
Market Capitalization (\$M)	3,415	239	726	27	0	22,768
AMEX	3,415	0	0.198	0.007	0	1
NASD	3,415	0	0.122	0.006	0	1

Table 7:
Determinants of the Percentage Bid-Ask Spread

Variable	Parameter Estimate	Standard Error	t-statistic	Pr > t
Intercept	3.024	0.195	15.5	<.0001
ln (Price)	-0.143	0.031	-4.6	<.0001
ln (Std.Dev Returns)	0.424	0.036	11.8	<.0001
ln (Turnover)	-0.464	0.018	-26.1	<.0001
ln (Market Cap)	-0.380	0.016	-24.2	<.0001
AMEX	-0.604	0.048	-12.5	<.0001
NASD	-0.354	0.056	-6.3	<.0001
Adjusted R2	0.61			
N. Obs	2,846			

Table 8:
Determinants of the Percentage Bid-Ask Spread

Variable	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	-0.524	0.107	-4.9	<.0001
ln (Price)	-0.243	0.015	-15.9	<.0001
ln (Std.Dev Returns)	0.388	0.018	21.1	<.0001
ln (Turnover)	-0.217	0.009	-23.9	<.0001
ln (Market Cap)	-0.218	0.008	-27.1	<.0001
AMEX	-0.201	0.024	-8.4	<.0001
NASD	-0.160	0.027	-5.9	<.0001
D1993	1.578	0.041	38.7	<.0001
D1994	1.563	0.039	40.3	<.0001
D1995	1.833	0.039	47.3	<.0001
D1996	1.959	0.038	51.0	<.0001
D1997	2.026	0.038	53.8	<.0001
D1998	2.011	0.038	53.2	<.0001
D1999	2.138	0.038	55.9	<.0001
D2000	2.009	0.039	51.9	<.0001
D2001	1.537	0.039	39.5	<.0001
D2002	1.261	0.039	32.3	<.0001
D2003	0.775	0.039	20.0	<.0001
D2004	0.217	0.038	5.7	<.0001
D2005	0.179	0.038	4.8	<.0001
D2007	0.201	0.040	5.0	<.0001
Adjusted R2	0.91			
N. Obs	2,846			

Table 9:
Determinants of the Percentage Bid-Ask Spread
Real Estate Coefficients

Year	Coef.	t-statistic
2001	-0.242	-2.41 b
2002	0.056	0.49
2003	0.168	1.91 c
2004	0.023	0.30
2005	0.079	1.18
2006	-0.016	-0.24
2007	-0.195	-1.97 b

Table 10:
Determinants of the Percentage Bid-Ask Spread 1994
Comparison with Bhasin, Cole and Kiely 1997

Variable	CC 2008		BCK 1997	
	Parameter	Estimate t Value	Parameter	Estimate t Value
Intercept	0.084	0.0	4.17	16.3 a
ln (Price)	-0.282	-6.6 a	-0.41	-3.3 a
ln (Std.Dev Returns)	0.567	9.1 a	0.38	6.7 a
ln (Dollar Volume)	-0.053	-0.2	-0.01	-0.1
ln (Turnover)	-0.071	-0.2	-0.17	-1.3
ln (Market Cap)	-0.087	-0.3	-0.08	-0.7
AMEX	-0.125	-2.7 a	-0.34	-5.8 a
NASD	0.450	8.3 a	0.28	4.0 a
Adj. Rsquare	0.93		0.89	
Number of Obs.	224		337	