Agree to Disagree: NAV Dispersion in REITs

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Abstract

This is the first study to analyze REIT Net Asset Value analyst coverage and dispersion. We find that NAV analyst coverage has a positive relationshp with REIT value and a negative relationship with REIT volatility. Subsequently we analyze NAV analyst estimate dispersion and find that it has a positive relationship with REIT leverage and volatility. We break down our sample by property type and find that retail REITs have the greatest NAV coverage and hospitality REITs have the greatest NAV analyst dispersion. Finally, we compare the significance of NAV forecast dispersion to earnings (FFO) forecast dispersion. We find that NAV dispersion has a significant negative relationship with REIT value whereas FFO dispersion is not found to have a significant relationship.

I Introduction

Net Asset Value in REITs is a widely relied upon metric of REIT value. The specific metric previously used in literature is the mean of analyst estimates of Net Asset Value (hereafter NAV). It has been incorporated in numerous studies including, but not limited to Barkham and Ward (1999), Clayton and MacKinnon (2003), Anderson et al. (2005), Ling and Naranjo (2006), Chiang (2009), Brounen et al. (2013), Yavas and Yildirim (2011), Pattitoni et al. (2013). We explore the content of this popular metric in more detail. We introduce and analyze the dispersion of analyst estimates of NAV. Ours is the first study to address the coverage and dispersion of Net Asset Value estimates. Further we compare NAV estimates to the previous studies of REIT earnings (FFO) estimates (Devos et al. (2007) and Downs and Guner (2006)) and analyze both NAV and FFO estimates in their relationship to REIT performance characteristics.

Based on conversations with industry insiders, we conclude that Net Asset Value estimates require greater subjectivity and independent analyst research than earnings estimates. This is due in large part to a lack of NAV guidance from the company. Capozza and Lee (1995) and Corgel (1997) discuss the challenges of estimating NAVs for REITs. These include identifying a value for management expertise and valuing the future performance of each asset on the balance sheet individually, for an aggregate value total. Green Street Advisors, as an example, in a document titled "REIT Valuation: The NAV-based Pricing Model" outline their own methodology for NAV estimation. It includes, but is not limited to, estimating the market value of assets, liabilities, joint ventures and land. The approach relies on multiple cap rate assumptions. Based on this methodology it is apparent that different subjective opinions of value could be incorporated in estimating NAV. Contrary to earnings, NAVs are not reported by the company. This is a crucial distinction since as Johnson (2004) points out: "dispersion of earnings expectations is under the control of firms themselves, they might actually benefit, via a lower cost of equity capital, by increasing [analyst] disagreement". In this way NAV is a superior measure to earnings since it is not manipulated by the firm. Figure 1 presents a graph of NAV analyst coverage over time. Figure 2 compares the number of NAV analyst estimates to FFO analyst estimates.

We begin our analysis with analyst coverage. We explore the relationship of NAV estimates and REIT performance characteristics, such as value, leverage, return on assets and volatility. Following Devos et al. (2007)'s study of earnings estimates, we document a positive relationship between analyst coverage of NAV and firm value, measured as Tobin's q. Subsequently we analyze analyst dispersion in NAV estimates. We refer to Varian (1985) for a prediction of the relationship of dispersion in opinion and value, and formulate a prediction of a negative relationship. Previously Diether et al. (2002) have found that dispersion in value estimates (proxied for by earning estimates) has a negative relationship with REIT returns. DeLisle et al. (2013) have shown that idiosyncratic volatility has a negative relationship with REIT returns. We bridge together these two strands of literature. First we introduce value dispersion without relying on earnings dispersion as a proxy for value. Then, we find that NAV dispersion has a positive relationship with leverage, volatility, both total and idiosyncratic. NAV dispersion has a negative and significant relationship with REIT value.

To perform our analysis we use data provided by SNL Financial for NAV estimates and REIT performance, I/B/E/S for earnings estimates, CRSP for stock performance data and the Federal Reserve of St. Louis for economic indicators.

The paper is organized as follows. Section II reviews related literature. Section II.D develops our hypotheses. Section III reports our main results. Section IV provides robustness verification and Section V gives summary and conclusions.

II Related Literature and Hypothesis Development

II.A Analyst Forecast Dispersion

Prior literature on analyst forecasts has been entirely based on earnings forecasts and this is the first study to analyze NAV forecasts. Since NAVs or other value estimates are not available for non-real estate firms, earnings forecasts have been used as a proxy for value. Diether et al. (2002) in a seminal work consider the dispersion of analyst forecasts. Their hypothesis is "The larger the disagreement about a stock's value (either caused by overconfidence or by inaccurate inferences about others' signals), the higher the market price relative to the true value of the stock, and the lower its future returns." Value in this case is not estimated, earnings are, however due to lack of a value estimate, it is deduced from earnings estimates. Diether et al. (2002) document a negative relationship between dispersion in analyst forecasts of earnings and future returns. They conclude that the dispersion in forecasts is not an indicator of firm risk. Diether et al. (2002) also show that analyst dispersion is positively related to earnings variability, standard deviation in returns and market beta and has a negative relationship with future returns. Johnson (2004) shows that firms with high book to market, high leverage and poor past performance are associated with higher dispersion.

II.B REITs and Earnings Forecasts

Downs and Guner (2006) document the high quality of REIT earnings forecasts. They provide evidence that REITs earnings forecasts are more accurate than those of non-real estate firms or comparison groups. These findings can be explained by the nature of REITs. The distribution requirements, tax free distributions, lease based cash flow streams and guidance on earnings all contribute to REITs earnings having greater predictability then general firms. Feng et al. (2011) provide a historic overview of REIT distribution guidelines and demostrate the consistency of FFO yields in REITs. Devos et al. (2007) examine the number of analysts covering REITs and find a positive relationship between analyst coverage and REIT value, as measured by Tobin's q.

II.C REITs and NAV

The market pricing of public real estate (REITs) relative to the private pricing of the underlying real estate (net asset value (NAV)) has received considerable research attention. Substantial variation is seen in the price at which REIT shares trade relative to their net asset values (NAV) and this has been of especial interest to researchers. A major focus has been examining the determinants of both the level of and changes in NAV premiums and the resulting effect on REIT prices. As pointed out by Gentry and Mayer (2002) and Capozza and Seguin (2003), REIT price-to-NAV has significant advantages over the market-to-book ratios for other operating firms due to the straightforward nature of REIT operations.

A major question is whether departures of REIT share prices from NAV are a function of "noise" (maybe resulting from investor sentiment or noise traders) or "information". For example, on the information side, Clayton and MacKinnon (2001) show that NAV premiums are related to REIT size, D/E ratio, and REIT liquidity. Additionally, Gentry et al. (2004) posit that departures from unity are not random and are more likely driven by earnings announcements, dividend declarations, or sell-side analyst recommendations. Also, Clayton and MacKinnon (2001), looking at REIT bid-ask spread changes in relation to fluctuations in the average REIT sector NAV premium, find that transaction costs (spreads) increase when REIT prices are getting closer to NAV and decrease when REIT prices are moving away from NAV. They argue this is consistent with the presence of a higher proportion of noise traders in the market when REIT prices are diverging from NAV and the presence of a higher proportion of informed traders when REIT prices are closer to NAV.

The traditional rational approach hypothesizes that NAV premiums and discounts reflect market or firm-specific factors. Under this approach there are a number of studies and a diverse set of findings: Adams and Venmore-Rowland. (1990) find that entrepreneurial ability of REIT management affects REIT NAV discounts; Capozza and Lee (1995) find that REIT NAV discounts can be partially explained by agency costs because they are correlated with expense ratios; Pontiff (1996) and Gemmill and Thomas (2002) find that variation in short sale constraints across firms and over time may help explain the cross-section of REIT NAV premiums and supports the rational approach; Ling and Ryngaert (1997) find that reputation or management skill may also influence valuations; Friday and Sirmans (1998) find the presence of external directors at least partially explains REIT discounts; Capozza and Seguin (1999) find that diversification by sector and location affects REIT NAV discounts; Barkham and Ward (1999) and Gentry et al. (2003)) find that potential capital gains taxes are a rational explanation for the existence of discounts to NAVs; Barkham and Ward (1999) and Clayton and MacKinnon (2001) find that the firm-size effect observed in the lower discounts for larger REITs is likely due to better access to capital markets, economies of scale and market liquidity; Clayton and MacKinnon (2003) find that NAV premiums are a function of REIT sector growth opportunities, investor desire for liquidity, and investor sentiment; Capozza and Seguin (2003) find that ownership concentration affects REIT discounts; Bond and Shilling (2004) find that that both systematic and unsystematic risks are associated with REIT NAV premiums; and Brounen et al. (2013) find that a REIT may trade below its NAV if there are additional costs associated with operating as a REIT versus alternative organizational forms.

The literature using behavioral models to explain NAV premiums and discounts is extensive and provides a wide array of results: Lee et al. (1991) find that discounts and premiums in closed-end funds are a result of investor sentiment. However, as they point out, a high percentage of REIT ownership is institutional (about half) so it would seem that a deviation of P/NAV = 1 would not be a function of investor sentiment; Barkham and Ward (1999) find that investor sentiment causes a common REIT sector effect in the cross-section of REIT NAV premiums; Gemmill and Thomas (2002) use mutual fund flows as an indicator of investor sentiment and find that investor sentiment predicts changes in closed-end fund discounts; Clayton and MacKinnon (2001), trying to determine if the REIT market is dominated by noise traders or rational investors, find that an increase in liquidity (maybe a result of a decrease in transactions costs) should cause NAV discounts to decrease (premiums increase) as more noise traders enter the market; Downs et al. (2001) and Simpson and Ramchander (2002) find that investor sentiment affects NAV discounts; Clayton and MacKinnon (2001) find that changes in NAV premiums and discounts are related to fundamentals at turning points of the real estate cycle and the level of noise trader activity; Gentry et al. (2004) find that a worthwhile trading strategy could be buying REITs trading at large P/NAV discounts and simultaneously shorting stocks trading at large premiums (supporting a behavioral explanation but recognizing that short sale constraints restrict arbitrage). However, Brounen et al. (2013) find that variation in short sale activity across REITs can account for at least one-third of the variation in NAV premiums; Pattitoni et al. (2013) find that NAV discounts could be a function of NAV miscalculation by expert assessors (this argument could both a behavioral and traditional perspective); and Lee et al. (2013) find that NAV premiums are negatively related to trading volume and positively related to lagged trading volume, argue that this implies herding activity and investor sentiment; and Mueller and Pfnuer (2013) find that NAV spreads are mean reverting and result from investor sentiment. The vast majority of the above mentioned studies, with the exception of Capozza and Lee (1995) have relied upon a mean of the NAV estimates provided by analysts.

II.D Hypotheses

Analyst coverage has previously been shown to have a positive relationship with firm value. Devos et al. (2007) document that earnings analyst coverage has a positive relationship with Tobin's q and justify their findings with both a monitoring and increased visibility theories. Their work leads us to our first hypothesis.

Hypothesis I: *REIT NAV analyst coverage has a positive relationship with REIT value.*

Volatility of REIT returns is primarily driven by idiosyncratic volatility, as shown by Ooi et al. (2009). Individual firm performance with a high degree of volatility would be a challenge to value. This rationale leads to our second hypothesis.

Hypothesis II: *REIT NAV analyst estimate dispersion has a positive relationship with REIT volatility.*

To assess the relationship between opinion dispersion and value, we refer to Varian (1985). He argues that divergence of opinion could indicate that an asset is more risky, and hence would decrease the value of the asset. An alternative explanation would be that the market price would be driven by the higher estimates, which would imply a positive relationship between divergence and value. We subscribe to the former view which Varian (1985) proves as follows.

Suppose all investors have a von Neumann-Morgenstern utility function for consumption, $u(c)$, with an associated Arrow-Pratt measure of absolute risk aversion, $r(c)$. There are S

states indexed by *s=1,...,S* and *n* investors indexed by *i=1,..,n*. There is a set of Arrow-Debreu securities that pay off one unit of consumption if and only if a given state of nature occurs. Allow π_{is} to denote consumer *i*'s probability that state *s* will occur. The weighted probability is defined by

$$q_{is} = \pi_{is}/\lambda_i \tag{1}$$

Summing over all investors we have consumption defined as:

$$\sum_{i=1}^{n} c_{is} = c_s = \sum_{i=1}^{n} f(p_s/q_{is}) \tag{2}$$

We omit the proof which shows that $f(p_s/q_{is})$ is a concave function of q_{is}, which means that a mean preserving spread in the distribution of q_{is} will decrease the value of the sum. If c is to remain fixed, p_s must decrease. This leads to our third hypothesis:

Hypothesis III: *REIT NAV analyst estimate dispersion has a negative relationship with REIT value.*

Diether et al. (2002), in their study of analyst dispersion on earnings estimates, find that dispersion is positively related to leverage. We expect to find a similar relationship with NAV estimate dispersion.

Hypothesis IV: *REIT NAV analyst estimate dispersion has a positive relationship with REIT leverage.*

Feng et al. (2011) document a higher distribution of earnings in hospitality, whereas other asset classes are more consistent. Motivated by their study and industry evidence we expect hotel REITs to have the greatest dispersion in NAV estimates.

Hypothesis V: *REIT NAV analyst estimate dispersion varies with property type and is highest for hospitality REITs.*

In the next section, we perform an empirical analysis to test these hypotheses and compare the relationship of NAV forecasts and earnings forecasts to REIT performance characteristics.

III Data and Empirical Analysis

Data

We collect data from the Ziman CRSP REIT, SNL REIT, and I/B/E/S databases. SNL Financial has provided us with the historical data on 149 REITs of NAV estimate analyst dispersion from 2005 to 2017. We include only equity REITs that are traded on the three major U.S. exchanges during the sample period. Table 1 reports an overview of the number of REITs with NAV estimates (Panel A), summary statistics (Panel B), and a correlation matrix (Panel C).

Our sample statistics are presented in Table 1. Panel A presents the historical number of analyst estimates for both NAVs and FFOs. In total, there are 149 REITs with NAV estimates whereas there are only 100 REITs with FFO estimates. Figure 1 shows the average number of NAV estimates per firm over the course of our sample period. In general, we observe an increase in coverage over time. Figure 2 displays a comparison of NAV coverage to FFO coverage. On average, among REITs with both NAV and FFO coverage, there are 3.5 more NAV estimates than FFO estimates. Among these REITs, less than five percent have fewer NAV estimates than FFO estimates.

Panel B presents summary statistics. ROA is defined as FFO divided by the book value of assets. The leverage ratio is defined as the amount of long-term debt divided by the book value of assets. NAV coverage is defined as the firm's number of NAV estimates on a particular date (acquired from SNL). FFO/EPS coverage is defined as the firm's number of EPS or FFO estimates on a particular date (acquired from IBES). Dispersion in analyst forecasts is computed at the firm-date level and is defined as the standard deviation of NAV estimates divided by the mean of NAV estimates. We note that there are substantially more observations of NAV coverage and dispersion than of FFO coverage and dispersion, due to greater number of analysts providing forecasts.

Panel C presents a correlation matrix from which it is evident that NAV coverage has a strong positive correlation with firm size and value. NAV dispersion has a substantial and positive correlation with leverage and volatility, and a negative one with firm value.

Table 2 presents NAV coverage by property type. We show that REITs focused on retail properties have the greatest coverage, with a mean of over eight analysts, and office and industrial REITs have less than half as many. These findings persist after we calculated orthogonal NAV coverage, controlling for size, leverage, return on assets and volatility.

Analyst coverage and firm value

Table 3 presents results on the relation between NAV analyst coverage and REIT characteristics. To measure REIT value we use Tobin's q as a measure of REIT value, defined as the market value of assets (the sum of the market value of equity and book value of debt) divided by the book value of assets (as reported on the balance sheet). In columns 4 we use both time and industry fixed effects and report standard errors that are clustered by firm. We find that NAV coverage has a positive and significant relationship with firm value, as measured by Tobin's q, consistent with our first hypothesis. We also find that it has a positive and significant relationship with size and a negative and significant relationship with volatility.

NAV Dispersion

Figure 4 provides a graph of NAV dispersion. Clearly NAV dispersion is highly counter cyclical, as it increased greatly during the financial crisis. Hypothesis II predicts a positive relationship with volatility, Hypothesis III predicts a negative relationship with value, and Hypothesis IV predicts a positive relationship with leverage. Figure 5, Panel A shows that the relationship between NAV dispersion and REIT volatility, it is positive. Table 4 presents a cross-sectional analysis of NAV dispersion. Panel A reports Fama-Macbeth cross-sectional regressions to explain NAV dispersion using a variety of REIT characteristics. All of these are proven to be correct predictions. As column 1 shows, REITs with greater NAV estimate dispersion tend to be less profitable and more highly levered. Greater total return volatility and a higher fraction of idiosyncratic risk are associated with more NAV dispersion. Panel B includes various corporate REIT variables that are included in NAV estimates. None of these are significant in explaining NAV dispersion. Panel C considers the relationship of credit analysts and debt rating with NAV dispersion. While the result is positive, the relationship significance is not robust to inclusion of control variables.

Table 5 provides results of testing our last prediction, Hypothesis V. Hospitality REITs do have much great mean dispersion in comparison to all other property types. This could be explained by the short term lease nature of hotels or by the large operating business component or by the greater analyst expertise required to value hotels. Orthogonal NAV dispersion confirms these results.

Subsequently we compare the significance on NAV dispersion to earnings estimate analyst dispersion. Figure 5 presents the comparison of FFO and NAV dispersion to REIT volatility. NAV dispersion has a positive relationship while the FFO relationship is less apparent. Panel A further confirms that NAV dispersion is highly counter cyclical, while FFO dispersion appears more evenly distributed. Table 6 shows our FFO analysis. FFO coverage has a positive relationship with REIT size and FFO dispersion has a negative relationship with return on assets and volatility. We compare the NPV coverage and dispersion and FFO coverage and dispersion in explaining REIT value. The results are reported in Table 7. NAV dispersion has a negative and significant relationship with REIT value.

IV Robustness to Alternative Value Specification and Market Conditions

IV.A Definition of Value

In order to verify that our results are not driven by the construction of Tobin's q, we consider an alternative definition of value, *Market-to-Book*. *Market-to-book* is defined as the market value of equity divided by the book value of equity. The results are provided in Table 8. Natural log of Market-to-Book is the dependent variable. Because NAV coverage and *Market-to-Book* may be determined simultaneously, we examine the relation between the two using a 3SLS regression model. Size, leverage, and equity return volatility are used as common explanatory variables. ROA and past 12-month stock return are explanatory variables unique to *Market-to-Book*, while the bid-ask spread (defined as the difference between the bid and ask prices divided by the mean of the two) and an NYSE dummy variable are unique to NAV coverage. Importantly, this analysis reveals that, while NAV coverage is associated with higher firm value, *Market-to-Book* is in itself not a particularly important determinant of NAV analyst coverage. NAV coverage is found to have a positive and significant relationship with value, similarly to our prior findings. We find a negative and even greater [in magnitude of coefficient] relationship of NAV dispersion and value, with similar statistical significance to the Tobin's q measure.

IV.B Market Conditions

Lastly we consider the impact of macroeconomic and market conditions on values of REITs and whether these were the cause of value fluctuations. We focus on the impact of capital markets and consider a series of proxies. Our first proxy is *Lending tightness*, which captures the net percentage of domestic banks reporting tighter lending standards for commercial real estate, measured by survey and reported by the Federal Reserve at St. Louis. Figure 6 presents a scatterplot of NAV dispersion and Lending Standards. There is a strong positive correlation of 51%. We suspect that both NAV dispersion and pessimism in lending standards capture fundamental market uncertainty regarding values. We include *Lending Tightness* in our specification along with the *REIT Index Level*, *CBOE VIX*, *Short-term Rate* (the three-month T-Bill interest rate), *Term Spread* (10-year minus 1-year Treasury Bond), and *Credit Spread* (BBB minus AAA corporate bond yields). The results are reported in Table 9. We use Tobin's q as the dependent variable in columns 1 to 3 and *Market-to-Book* as the dependent variable in columns 4 to 6. The findings remain consistent with our hypotheses. NAV coverage is positive and statistically significant and NAV dispersion is negative and statistically significant in all specifications.

V Summary and Conclusions

This study of NAV estimates has focused on analyst coverage and estimate dispersion. We find that similar to FFO analyst coverage, NAV coverage has a positive relationship with firm value. The findings differ on dispersion of FFO estimates versus NAV estimates. NAV dispersion has a significant positive relationship with REIT leverage, total and idiosyncratic volatility. NAV dispersion has a negative relationship with REIT value. FFO dispersion has a positive and significant relationship with REIT volatility and a negative relationship with return on assets. FFO dispersion is not significant in explaining REIT value. The findings are robust to varying specifications of value and to inclusion of a series of controls for economic conditions.

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Table 1. Descriptive Statistics

This table presents an overview of REITs used in this study in Panel A, summary statistics in Panel B, and a correlation matrix in Panel C. Leverage ratio is defined as total debt divided by total assets. Tobin's q is defined as the sum of the market value of equity and book value of debt divided by the sum of book value of equity and book value of debt. The market-to-book ratio (M/B) is defined as the market value of equity divided by the book value of equity. Return volatility is calculated on a rolling basis using weekly returns and a one year window. Idiosyncratic volatility fraction represents the ratio of idiosyncratic volatility to total volatility using weekly returns, a one year window, and a broad stock market factor. The bid-ask ratio is calculated as the difference between the bid and ask prices divided by one half of the sum of the bid and ask prices. NAV (FFO) coverage indicates the number of analysts providing an NAV (FFO) estimate at any given point in time. NAV (FFO) dispersion represents the percentage standard deviation of analyst estimates divided by the mean of analyst estimates. Data are monthly from January 2005 to December 2016. Data are obtained from CRSP, Compustat, SNL REIT, and IBES.

Panel A. Coverage (Number of REITs)

Year	**NAV**	**NAV & FFO**	**FFO**
	(SNL REIT)	(SNL REIT ∩ IBES)	(IBES, SIC=6798)
All	149	113	274
2005	102	59	129
2006	100	59	130
2007	88	52	120
2008	75	42	100
2009	73	43	110
2010	82	54	123
2011	84	59	130
2012	89	63	141
2013	96	69	161
2014	99	75	170
2015	103	82	192
2016	98	79	195

Panel B. Summary Statistics

	Mean	**S.D.**	**Min**	**Med**	**Max**	***N***
Market Cap ($, bil)	3.42	4.66	0.04	1.79	24.88	12,323
ROA (%)	2.13	0.61	0.00	2.03	6.75	12,065
Leverage Ratio	0.58	0.15	0.02	0.57	1.42	12,173
Tobin's q	1.26	0.35	0.23	1.20	3.12	12,173
Market-to-Book	1.73	1.13	0.06	1.47	7.13	12,173
Return (%, monthly)	1.04	10.40	-79.80	1.18	236.44	12,180
Return Volatility (%, annual)	31.34	25.80	11.03	22.26	160.25	12,316
Idiosyncratic Vol Fraction	0.61	0.20	0.14	0.62	1.00	11,151
Bid-Ask Ratio	0.11	0.14	0.02	0.08	0.66	12,323
NAV Coverage	5.67	3.11	1.00	5.00	18.00	12,323
FFO Coverage	6.38	6.25	0.00	5.00	27.00	12,323
NAV Dispersion (%)	10.94	9.55	0.06	8.71	71.98	11,348
FFO Dispersion (%)	3.72	8.95	0.09	1.45	73.33	7,880

Panel C. Correlation Matrix

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1)	Market Cap	1.00												
(2)	ROA (%)	-0.01	1.00											
(3)	Leverage Ratio	0.06	0.20	1.00										
(4)	Tobin's q	0.46	0.43	0.23	1.00									
(5)	Market-to-Book	0.44	0.43	0.42	0.88	1.00								
(6)	Return (%, monthly)	-0.02	-0.01	0.00	-0.05	-0.04	1.00							
(7)	Total Volatility	-0.15	-0.06	0.23	-0.31	-0.27	-0.01	1.00						
(8)	Idiosyncratic Fraction	-0.02	0.01	-0.03	0.04	0.04	-0.00	-0.38	1.00					
(9)	Bid-Ask Ratio	-0.10	-0.05	0.18	-0.23	-0.20	-0.02	0.72	-0.26	1.00				
(10)	NAV Coverage	0.46	-0.11	0.04	0.37	0.26	-0.00	-0.10	-0.20	-0.05	1.00			
(11)	FFO Coverage	0.33	0.01	-0.00	0.25	0.19	0.01	-0.09	-0.14	-0.05	0.47	1.00		
(12)	NAV Dispersion (%)	-0.14	-0.11	0.26	-0.26	-0.23	0.08	0.63	-0.14	0.49	-0.13	-0.07	1.00	
(13)	FFO Dispersion (%)	-0.12	-0.20	0.06	-0.18	-0.18	0.03	0.16	0.11	0.09	-0.24	-0.26	0.29	1.00

Table 2. NAV Coverage by REIT Type

This table presents information on the coverage of NAV estimates by REIT type. "NAV Coverage" refers to the number of NAV analyst estimates at any given point in time. "Orthogonal NAV coverage" is defined as residual of a regression of NAV dispersion on REIT characteristics, including size, leverage, ROA, Tobin's q, return volatility, and idiosyncratic return fraction. NAV data are from SNL REIT. Data are monthly from January 2005 to December 2016.

	NAV Coverage			Orthogonal NAV Coverage		
	Mean	S.D.	Median	Mean	S.D.	Median
Office/Industrial	3.7	2.0	4	-0.87	1.8	-0.79
Shopping/Retail	8.2	3.7	8	1.9	2.4	1.6
Multifamily/Residential	5.6	2.6	6	-0.21	2.4	-0.24
Hotel	5.6	3.0	5	-0.22	1.9	-0.26

Table 3. NAV Analyst Coverage

This table presents the results on determinants of NAV analyst coverage. NAV coverage is defined as the log of the number NAV estimates. Tobin's q is defined as the market value of assets (market value of equity plus book value of debt) divided by the book value of assets. Panel regressions include time and REIT type fixed effects as indicated, and standard errors clustered by firm. NAV data are from SNL REIT. Data are monthly from January 2005 to December 2016.

	Ln(NAV Coverage)			
	(1)	(2)	(3)	(4)
Ln(Size)	0.28***		0.26***	0.25***
	(8.15)		(6.48)	(6.41)
Leverage	-0.42		-0.22	-0.29
	(-1.65)		(-0.82)	(-1.18)
ROA	-0.19***		-0.19***	-0.18***
	(-2.91)		(-2.81)	(-2.76)
Ln(Tobin's q)	0.96***		0.72***	0.76***
	(6.58)		(3.90)	(4.31)
Ln(Volatility)		-0.81***	-0.45***	-0.45***
		(-6.64)	(-3.55)	(-3.62)
Idiosyncratic Fraction		-0.51**	0.11	0.14
		(-2.27)	(0.55)	(0.70)
Return (12m)		0.14	-0.055	-0.060
		(1.29)	(-0.57)	(-0.63)
Ln(Bid-Ask)		0.092***	0.0041	0.0048
		(3.55)	(0.23)	(0.27)
NYSE Dummy		0.72***	0.28*	0.28*
		(6.48)	(1.79)	(1.78)
Constant	-2.17***	-1.89***	-3.96***	-3.90***
	(-3.81)	(-3.14)	(-4.35)	(-4.37)
REIT Type Fixed Effects	No	No	No	Yes
Observations	12,065	10,779	10,538	10,538
Adjusted R^2	0.437	0.229	0.456	0.458

Table 4. REIT NAV Dispersion

This table presents regressions explaining the cross-section of REIT NAV Dispersion using OLS panel regressions. Panel A contains the baseline regression results, Panel B examines more detailed aspects of the REIT structure, and Panel C displays an analysis of S&P credit rating. NAV Dispersion is defined as the standard deviation of NAV estimates divided by the mean of NAV estimates. As indicated, REIT control variables include Ln(Size), Leverage, ROA, Ln(Tobin's q), Ln(Volatility), Idiosyncratic Fraction, and Return (12m). Regressions include time and REIT type fixed effects as indicated, and standard errors clustered by firm. NAV data are from SNL REIT. Data are monthly from January 2005 to December 2016.

Panel A. Baseline OLS Regression Results

	Ln(NAV Dispersion)			
	(1)	(2)	(3)	(4)
Ln(Size)	0.020		0.023	0.0075
	(0.73)		(0.93)	(0.27)
Leverage	0.88***		0.38*	0.88***
	(3.49)		(1.90)	(4.90)
ROA	-0.073*		-0.12***	-0.19***
	(-1.68)		(-2.80)	(-4.92)
Ln(Tobin's q)	-0.43***		-0.086	-0.030
	(-3.82)		(-0.70)	(-0.25)
Ln(Volatility)		0.74***	0.61***	0.45***
		(6.02)	(5.63)	(4.86)
Idiosyncratic Fraction		0.41**	0.41**	0.47***
		(2.02)	(2.13)	(2.98)
Return (12m)		-0.11	-0.060	-0.043
		(-1.37)	(-0.70)	(-0.56)
Ln(NAV Coverage)	0.14**	0.21***	0.15**	0.19***
	(2.16)	(3.73)	(2.52)	(3.19)
Constant	1.35***	4.62***	3.89***	3.42***
	(3.51)	(9.20)	(6.71)	(5.97)
REIT Type Fixed Effects	No	No	No	Yes
Observations	11,122	10,004	9,771	9,771
Adjusted R^2	0.245	0.262	0.284	0.329

Panel B. Detailed REIT Structure

	Ln(NAV Dispersion)				
	(1)	(2)	(3)	(4)	(5)
Total Properties	-0.12				
(scaled by Total Assets)	(-0.53)				
Intangible Assets		0.53			
(scaled by Total Assets)		(0.87)			
Partnership Investments			-0.47		
(scaled by Total Assets)			(-0.90)		
Partnership Income				-0.075	
(scaled by NOI)				(-0.28)	
Property Management Income					0.32
(scaled by NOI)					(0.63)
REIT Control Variables	Yes	Yes	Yes	Yes	Yes
REIT Type Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	9,753	9,771	9,675	9,728	8,803
Adjusted R^2	0.319	0.319	0.319	0.319	0.332

Panel C. S&P Credit Rating

	Ln(NAV Dispersion)		
	(1)	(2)	(3)
S&P Credit Rating	0.041*	0.024	-0.012
	(1.87)	(1.11)	(-0.53)
REIT Control Variables	Yes	Yes	Yes
REIT Type Fixed Effects	No	No	Yes
Observations	5,789	5,129	5,129
Adjusted R^2	0.282	0.300	0.338

Table 5. NAV Dispersion by REIT Type

This table presents information on the dispersion of NAV estimates by REIT type. "NAV Dispersion" is defined as the standard deviation of NAV estimates divided by the mean of NAV estimates and is reported in percentage terms. Only REITs with two or more estimates are included. "Orthogonal NAV Dispersion" is defined as residual of a regression of NAV dispersion on REIT characteristics, including size, leverage, ROA, Tobin's q, return volatility, and idiosyncratic return fraction. NAV data are from SNL REIT. Data are monthly from January 2005 to December 2016.

	NAV Dispersion (%)			Orthogonal NAV Dispersion (%)		
	Mean	S.D.	Median	Mean	S.D.	Median
Office/Industrial	11.0	8.4	9.1	0.38	6.6	-0.19
Shopping/Retail	9.5	7.4	8.0	-1.3	5.9	-1.5
Multifamily/Residential	10.0	6.7	8.5	-0.34	5.1	-0.34
Hotel	14.9	15.8	9.9	2.4	11.9	0.66

Table 6. FFO Analyst Coverage and Forecast Dispersion

This table presents results on the determinants of FFO analyst coverage and dispersion. FFO Coverage refers to the number of FFO analyst forecasts. FFO Dispersion is defined as the standard deviation of FFO estimates divided by the mean of FFO estimates. As indicated, REIT control variables include Ln(Size), Leverage, ROA, Ln(Tobin's q), Ln(Volatility), Idiosyncratic Fraction, and Return (12m). Regressions include time and REIT type fixed effects as indicated, and standard errors clustered by firm. FFO data are from IBES. Data are monthly from January 2005 to December 2016.

	Ln(FFO Coverage)		Ln(FFO Dispersion)	
	(1)	(2)	(3)	(4)
Ln(Size)	0.41***	0.41***	-0.11	-0.078
	(8.18)	(8.19)	(-1.63)	(-1.11)
Leverage	-0.21	-0.34	0.43	0.65*
	(-0.55)	(-1.11)	(1.34)	(1.96)
ROA	-0.037	-0.012	-0.27***	-0.33***
	(-0.48)	(-0.17)	(-3.45)	(-4.72)
Ln(Tobin's q)	0.31	0.39*	-0.23	-0.15
	(1.26)	(1.77)	(-1.23)	(-0.81)
Volatility	-0.21	-0.21	1.56***	1.27***
	(-1.22)	(-1.28)	(9.33)	(7.15)
Idiosyncratic Fraction	-0.24	-0.17	0.99***	1.12***
	(-1.03)	(-0.80)	(3.70)	(4.42)
Return (12m)	-0.066	-0.076	-0.20	-0.28*
	(-0.62)	(-0.75)	(-1.32)	(-1.89)
Ln(Bid-Ask)	0.012	0.012		
	(0.77)	(0.77)		
NYSE Dummy	0.46***	0.47***		
	(3.06)	(3.01)		
Ln(FFO Coverage)			-0.31***	-0.40***
			(-2.78)	(-3.76)
Constant	-5.03***	-4.99***	9.00***	7.73***
	(-4.46)	(-4.69)	(9.13)	(6.90)
REIT Type Fixed Effects	No	Yes	No	Yes
Observations	6,789	6,789	6,563	6,563
Adjusted R^2	0.570	0.578	0.436	0.451

Table 7. Tobin's q and Analyst Coverage

This table presents the results on the relation between Tobin's q and NAV analyst coverage. NAV (FFO) coverage is defined as the log of the number NAV (FFO) estimates. Tobin's q is defined as the market value of assets (market value of equity plus book value of debt) divided by the book value of assets. Regressions include time and REIT type fixed effects as indicated, and standard errors clustered by firm. NAV data are from SNL REIT, and FFO data are from IBES. Data are monthly from January 2005 to December 2016.

	Ln(Tobin's q)					
	(1)	(2)	(3)	(4)	(5)	(6)
Ln(NAV Coverage)	0.10***		0.055**	0.047*		0.00081
	(4.05)		(2.17)	(1.82)		(0.03)
Ln(FFO Coverage)		0.063	0.022	0.035		0.040
		(1.52)	(0.51)	(0.93)		(1.19)
Ln(NAV Dispersion)					-0.029**	-0.030**
					(-2.48)	(-2.61)
Ln(FFO Dispersion)					-0.0048	-0.0019
					(-0.54)	(-0.23)
Ln(Size)	0.010	0.013	0.013	0.0081	0.033**	0.019
	(0.71)	(0.57)	(0.57)	(0.37)	(2.19)	(1.09)
Leverage	0.48***	0.51***	0.50***	0.58***	0.54***	0.55***
	(4.38)	(3.81)	(3.73)	(4.88)	(4.87)	(4.94)
ROA	0.16***	0.14***	0.15***	0.12***	0.12***	0.11***
	(5.22)	(3.60)	(3.70)	(3.62)	(4.03)	(3.88)
Ln(Volatility)	-0.27***	-0.33***	-0.30***	-0.29***	-0.26***	-0.26***
	(-6.99)	(-6.70)	(-6.31)	(-6.40)	(-6.72)	(-6.93)
Idiosyncratic Fraction	-0.28***	-0.33**	-0.34**	-0.36**	-0.29**	-0.27**
	(-2.91)	(-2.23)	(-2.34)	(-2.60)	(-2.46)	(-2.43)
Return (12m)	0.20***	0.19***	0.19***	0.19***	0.18***	0.18***
	(7.08)	(5.20)	(5.31)	(5.33)	(5.53)	(5.79)
Constant	-1.69***	-1.90***	-1.79***	-1.65***	-1.54***	-1.52***
	(-6.18)	(-5.55)	(-5.30)	(-4.67)	(-7.07)	(-7.24)
REIT Type Fixed Effects	No	No	No	Yes	Yes	Yes
Observations	10,538	6,789	6,789	6,789	6,178	6,178
Adjusted R^2	0.566	0.568	0.574	0.602	0.657	0.660

Table 8. Analysts' NAV Estimates and Market-to-Book Measure of Firm Value

This table presents the results on the relation between Market-To-Book Ratio and analysts' NAV estimates. Market-to-Book ratio is defined as the market value of equity divided by the book value of equity. OLS regressions include REIT type fixed effects as indicated, and standard errors clustered by firm. Because NAV coverage and Market-to-Book may be determined simultaneously, we examine the relation between the two using a 3SLS regression model. NAV data are from SNL REIT. Data are monthly from January 2005 to December 2016.

	OLS Regressions		*3SLS Regression*	
	Ln(M/B)		Ln(M/B)	Ln(NAV Cov)
	(1)	(2)	(3)	(4)
Ln(NAV Coverage)	0.11**		0.71***	
	(2.20)		(9.07)	
Ln(NAV Dispersion)		-0.059**		
		(-2.32)		
Ln(M/B)				-0.022
				(-0.78)
Ln(Size)	0.019	0.067**	-0.18***	0.29***
	(0.61)	(2.30)	(-7.46)	(52.88)
Leverage	1.94***	2.01***	1.57***	0.038
	(6.08)	(5.63)	(33.03)	(0.55)
ROA	0.31***	0.29***	0.31***	
	(5.80)	(5.07)	(32.32)	
Ln(Volatility)	-0.84***	-0.92***	-0.55***	-0.18***
	(-9.10)	(-9.31)	(-20.46)	(-6.09)
Idiosyncratic Fraction	-0.97***	-0.90***	-0.82***	-0.35***
	(-4.88)	(-4.31)	(-14.98)	(-7.00)
Return (12m)	0.51***	0.52***	0.33***	
	(7.64)	(6.62)	(15.68)	
Ln(Bid-Ask)				-0.049***
				(-5.19)
NYSE Dummy				0.33***
				(13.15)
Constant	-4.75***	-5.54***	-1.30***	-4.08***
	(-7.57)	(-8.64)	(-3.96)	(-28.08)
REIT Type Fixed Effects	Yes	Yes	No	No
Observations	10,412	9,664	10,412	
Adjusted R^2	0.614	0.606	—	

Table 9: Firm Value, Analysts' NAV Estimates, and Market Conditions

This table presents the results on the relation between Tobin's q and analysts' NAV estimates. In addition to REIT-level control variables, these regressions include various market-level variables, including lending tightness, REIT market index level, CBOE VIX, the short-term three-month T-Bill interest rate, term spread (10-year minus 1-year Treasury Bond), and the credit spread (BBB minus AAA corporate bond yields). Lending tightness captures the net percentage of domestic banks reporting tighter lending standards for commercial real estate, measured by survey and reported by the Federal Reserve at St. Louis. Tobin's q (Market-to-book equity) is defined as the market value of assets (equity) divided by the book value of assets (equity). OLS regressions include REIT type fixed effects as indicated, and standard errors clustered by firm. NAV data are from SNL REIT. Data are monthly from January 2005 to December 2016. Constant has been omitted from the report.

	Ln(Tobin's q)			Ln(Market-to-Book)		
	(1)	(2)	(3)	(4)	(5)	(6)
Ln(NAV Coverage)	0.11***		0.14***	0.18***		0.25***
	(4.44)		(4.86)	(3.63)		(4.46)
Ln(NAV Dispersion)		-0.026*	-0.022**		-0.083***	-0.097***
		(-1.96)	(-2.10)		(-2.91)	(-3.74)
Ln(Size)	0.016	0.042***	0.014	0.034	0.072**	0.018
	(1.12)	(3.14)	(0.98)	(1.10)	(2.49)	(0.58)
Leverage	0.51***	0.51***	0.51***	1.92***	1.93***	1.90***
	(5.30)	(4.86)	(5.19)	(6.04)	(5.44)	(5.44)
ROA	0.15***	0.15***	0.15***	0.30***	0.31***	0.31***
	(5.45)	(5.11)	(5.30)	(5.75)	(5.27)	(5.38)
Volatility	-0.20***	-0.25***	-0.19***	-0.57***	-0.68***	-0.57***
	(-9.57)	(-9.39)	(-8.21)	(-10.29)	(-11.21)	(-10.72)
Idiosyncratic Fraction	-0.28***	-0.34***	-0.25***	-0.87***	-0.99***	-0.85***
	(-4.77)	(-5.54)	(-4.58)	(-7.09)	(-8.37)	(-7.46)
Return (12m)	0.091***	0.092***	0.094***	0.21***	0.21***	0.21***
	(5.83)	(5.21)	(5.66)	(5.49)	(4.80)	(5.12)
Lending Tightness	0.048**	0.055**	0.036	0.18***	0.22***	0.19***
	(2.25)	(2.12)	(1.51)	(2.93)	(3.35)	(3.05)
REIT Index Level	0.072***	0.061***	0.066***	0.14***	0.12***	0.13***
	(4.53)	(4.00)	(4.62)	(3.76)	(3.39)	(3.89)
CBOE VIX	-0.32***	-0.30***	-0.35***	-0.64***	-0.55***	-0.65***
	(-6.12)	(-5.62)	(-7.30)	(-4.72)	(-4.12)	(-5.01)
Short-term Rate	0.015**	0.0064	0.011*	0.039***	0.014	0.023
	(2.11)	(0.94)	(1.67)	(2.64)	(0.89)	(1.48)
Term Spread	0.014	0.014	0.011	0.046**	0.029	0.022
	(1.52)	(1.56)	(1.17)	(2.26)	(1.26)	(1.02)
Credit Spread	0.056***	0.054***	0.053***	0.082**	0.019	0.011
	(4.33)	(4.12)	(4.03)	(2.53)	(0.53)	(0.32)
REIT Type Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,536	9,771	9,771	10,412	9,664	9,664
Adjusted R^2	0.568	0.538	0.585	0.612	0.592	0.618

Figure 1. Average Firm-Level NAV Analyst Coverage

This figure displays the average firm-level NAV coverage over time. NAV coverage is defined as the number of NAV analyst estimates. Sample period spans January 2005 to December 2016.

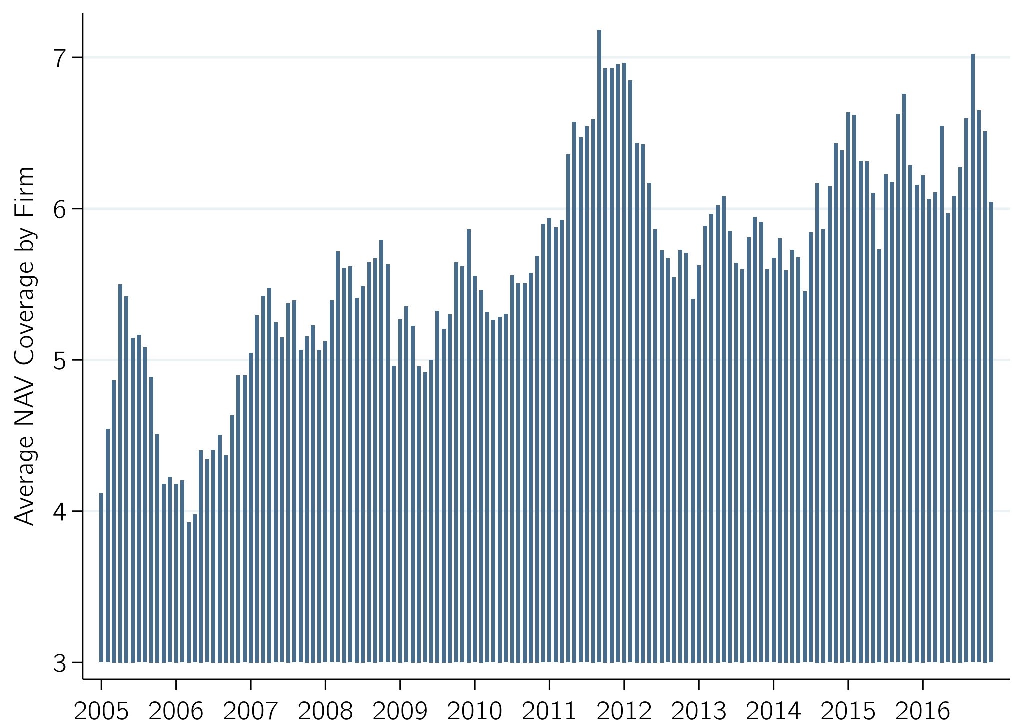
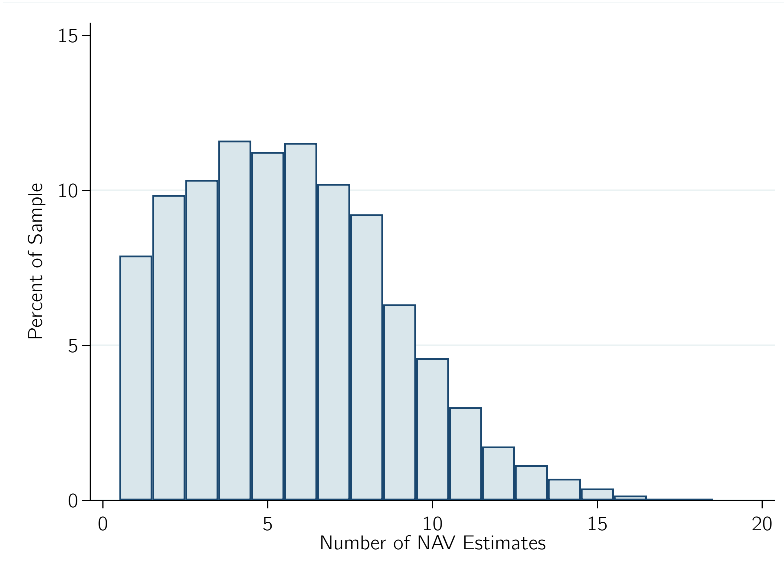


Figure 2. Distribution of NAV Coverage

This figure displays a comparison of NAV coverage to FFO coverage. Panel A is a histogram showing the distribution of firm-level NAV coverage. Panel B is a histogram showing the difference between NAV coverage and FFO coverage.

Panel A. NAV Coverage



Panel B. NAV Coverage minus FFO Coverage

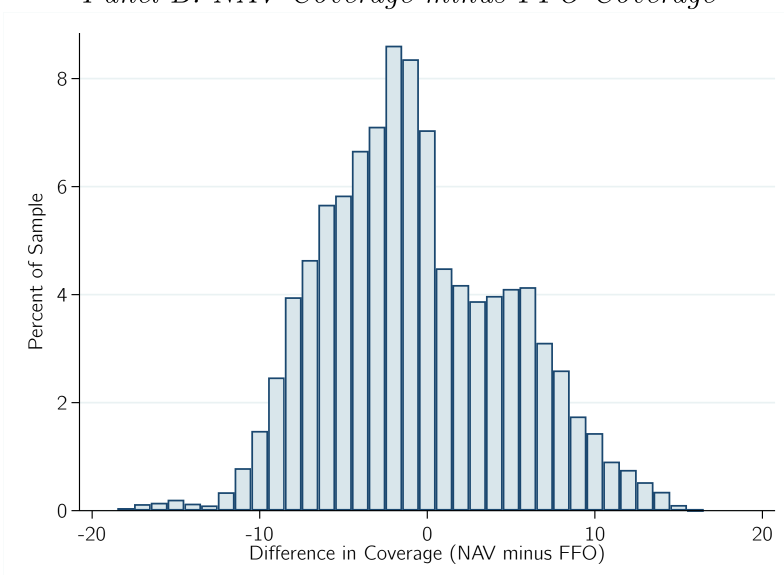


Figure 3. FFO Analyst Coverage and NAV Information Environment

This figure displays NAV dispersion by groups of FFO coverage (number of analysts in IBES). NAV dispersion is orthogonalized to NAV coverage and other firm characteristics (size, leverage, ROA, Tobin's q, return volatility, idiosyncratic volatility fraction, time fixed effects, and REIT type fixed effects).

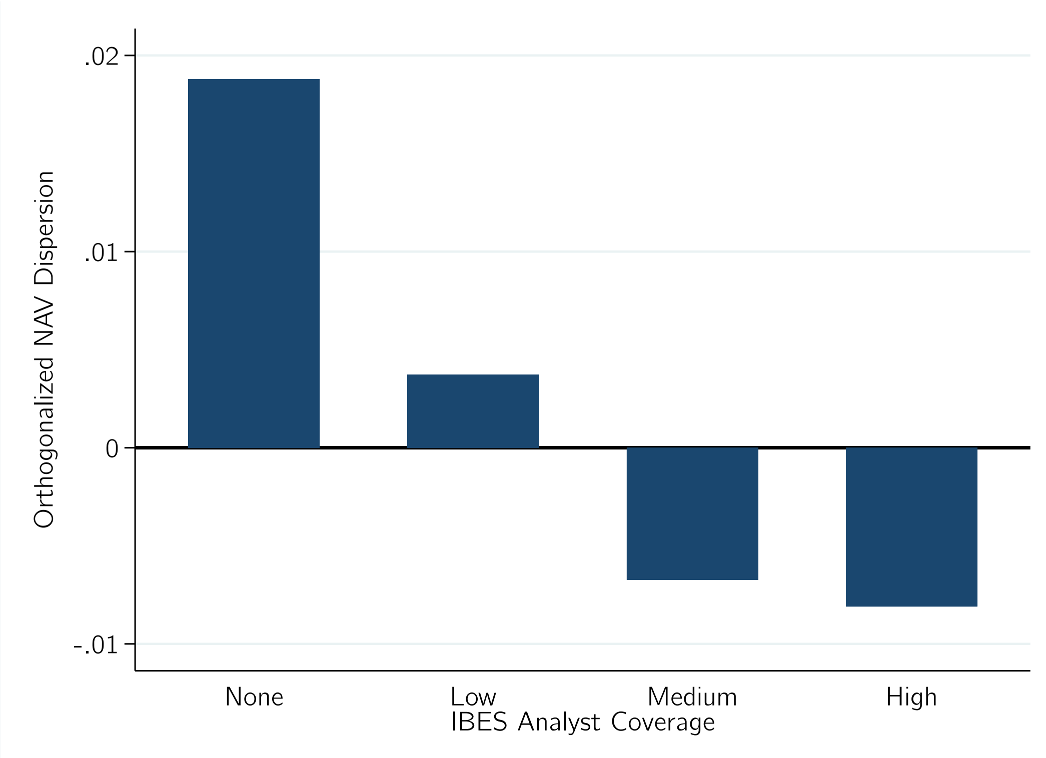
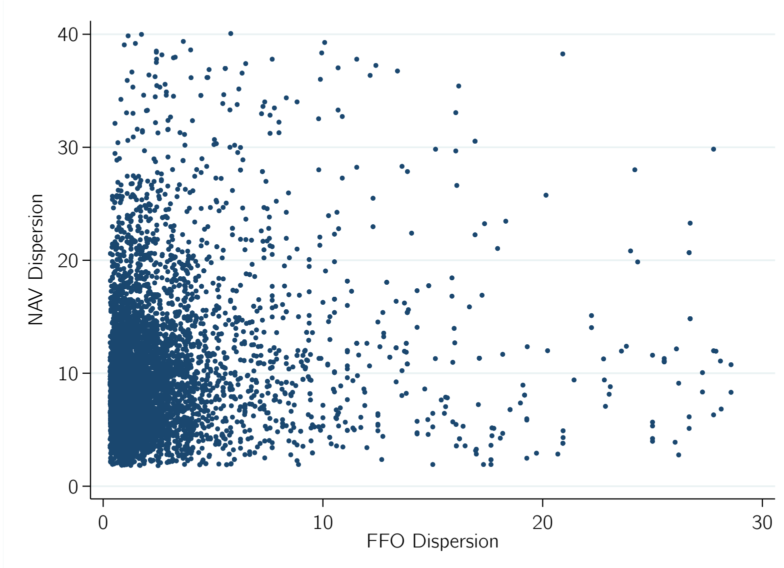


Figure 4. NAV Dispersion versus FFO Dispersion

This figure displays a scatter plot of NAV dispersion and FFO dispersion (Panel A) and the time series of each measure (Panel B). In Panel A, dots in the upper left corner (lower right corner) represent REITs with high (low) NAV dispersion and low (high) FFO dispersion. Panel B represents the average monthly time series (weighted by equity market capitalization) for NAV dispersion and FFO dispersion.

Panel A. Scatter Plot



Panel B. Time Series

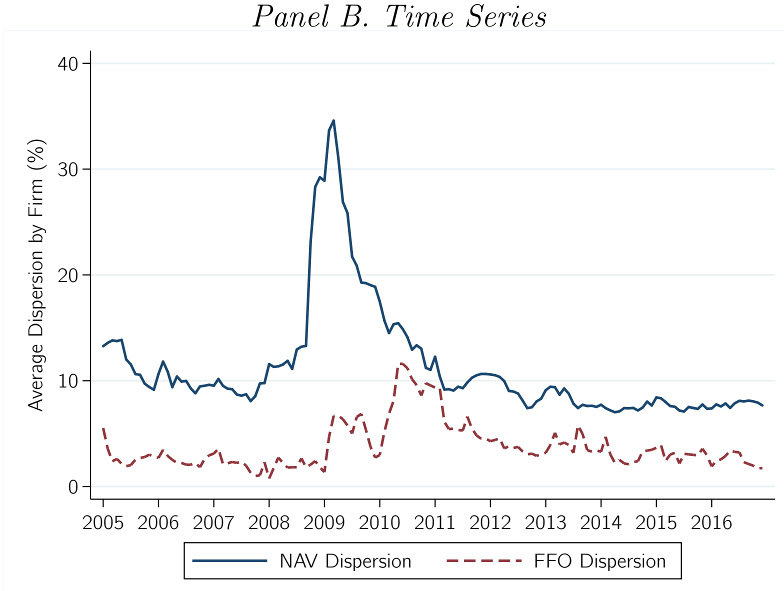
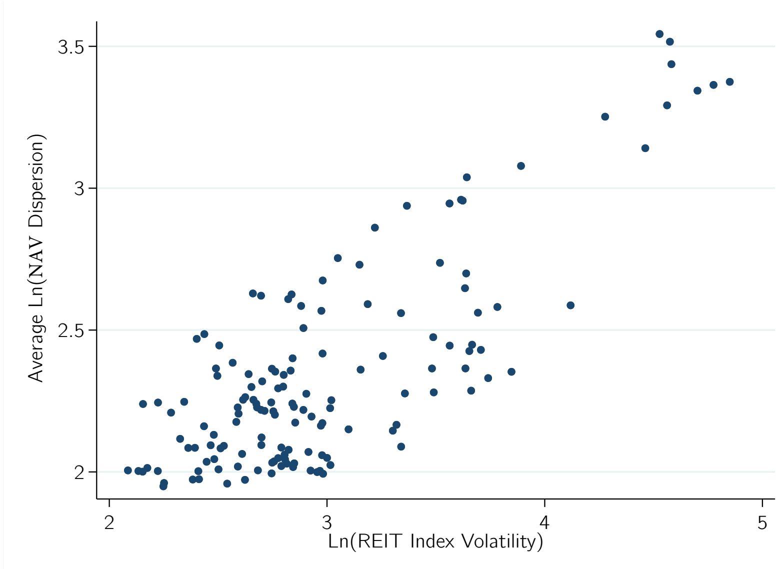


Figure 5. Analyst Dispersion and REIT Market Index Volatility

This figure shows the relation between average analyst dispersion and the REIT market index volatility. Panel A (Panel B) is a scatter plot between the average NAV dispersion by month (average FFO dispersion by month) and the REIT index volatility. REIT market index olatility is measured using daily returns on a three-month rolling basis. The REIT market index is the FTSE Nareit U.S. Real Estate Index Series for equity REITs.

Panel A. NAV Dispersion



Panel B. FFO Dispersion

Figure 6. Lending Standard Tightness and Average NAV Dispersion

This figure presents a scatter plot of average NAV dispersion and the net percentage of domestic banks tightening standards for commercial real estate loans (source: lender survey, Federal Reserve Bank). NAV dispersion is computed for each REIT at each point in time as the standard deviation of NAV estimates divided by the mean NAV estimate. NAV dispersion is then cap-weighted across all firms at each point in time. The simple correlation between the two time series is 51%.