REIT Valuation Multiples
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Abstract

This paper examines the accuracy of valuation multiples in the Real Estate Investment Trusts (REITs) Industry. We evaluate fifteen multiples based on share price, enterprise value, and adjusted enterprise value. We construct benchmark multiples by grouping REITs into property categories. We place a given REIT into a group based on its property focus reported by SNL Financial and National Association of Real Estate Investment Trusts (NAREIT). The accuracy of valuation multiples are examined by using errors defined as the natural log of the estimated value to actual value ratio. Findings suggest that valuation errors are within a 15% threshold, mostly for enterprise value to EBITDA and enterprise value to EBIT multiples. In addition, we find that REIT specific multiples such as price-to-funds from operations, price-to-adjusted funds from operations, and price-to-NAV produce valuation errors less than that of earnings based multiples.

I.   Introduction

Value of an asset should be based on present value of its expected cash flows discounted at a rate consistent with risk of those expected cash flow. The discounted cash flows (DCF) method may not be appropriate when expected cash flows cannot be estimated due to lack of data or significant uncertainty about future. Valuation multiples can be used to generate reasonable estimates when a firm is in bankruptcy or possibility of filing one is high, going through an initial public offering or leveraged buyout.

A valuation multiple is applied by taking the product of value source by a relevant benchmark multiple, typically a median of comparable companies. This method incorporates market expectations on similar companies into the estimation because benchmark multiples are established using market values. The use of benchmark multiples does not necessarily make the process more accurate since differences in financial leverage or accounting practices reduce similarity among firms. Nevertheless, valuation multiples have been used in many cases. These include Kaplan and Ruback (1995) with leveraged transactions, Hotchkiss and Mooradian (1998) and Gilson, Hotchkiss, and Ruback (2000) with bankrupt companies, Kim and Ritter (1999) with IPOs, Berger and Ofek (2002) with diversified firms, and Osmundsen, Asche, Misund, and Mohn (2005) with international oil companies.

In addition to the applications of multiples, there are studies focusing on examining the performance of valuation multiples including Kaplan and Ruback (1995), Baker and Ruback (1999), Cheng and McNamara (2000), Lie and Lie (2002), Liu, Nissim, and Thomas (2002 and 2006), Yoo (2006), and Schreiner and Spremann (2007). General findings of these articles suggest that multiples based on forward earnings perform relatively well.

In this study, we aim to contribute to literature by examining accuracy of valuation multiples in the REIT industry by using traditional multiples as well as multiples commonly used with REITs. Though some of the previous research uses industry based benchmarks, results are typically reported on aggregate. Baker and Ruback (1999) and Liu, Nissim, and

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Thomas (2002) report industry level accuracy of multiples; however, Baker and Ruback (1999) sample is based on the S&P 500 Index that did not include any REITs in 1995 and Liu, Nissim, and Thomas (2002) sample does not report results for REITs. We choose the REIT industry due to its unique nature and source of value. REITs may be viewed as closed-end funds that invest in real estate and report earnings in a different format than most other publicly owned companies. In addition, REITs must maintain certain qualifications to be exempt from corporate income taxation.[19]

We establish benchmark multiples by grouping REITs into property categories. Property categories are based on property focus reported by SNL Financial and National Association of Real Estate Investment Trusts (NAREIT). The accuracy of valuation multiples are examined by using errors defined as the natural log of the estimated value to actual value ratio. Findings suggest that valuation errors are within a 15% threshold, mostly for enterprise value to EBIT and enterprise value to EBITDA multiples. In addition, we find that REIT specific multiples such as price-to-funds from operations, price-to-adjusted funds from operations, and price-to-NAV produce valuation errors less than that of earnings based multiples.

The paper proceeds as follows. Section II reviews relevant literature. Section III describes the sample and methods used. Section IV presents the results and Section V provides robustness analysis using the harmonic mean method. Section VI concludes the paper.

II.   Literature Review

Valuation multiples provide a quick way of assigning a value to a security since it requires minimal data on a security. The estimated value is determined by multiplying its value source by the multiple of comparable firms. According to Kaplan and Ruback (1999) valuation multiples rely on two assumptions: first, a security and relevant comparables must have similar risk and return prospects. Second, the association between value source and relevant multiple is linear.

We examine the related literature while focusing on two aspects: the use and accuracy of valuation multiples. Valuation multiples have been used in many different context. Kaplan and Ruback (1995) compare market values of highly levered transactions to valuation obtained from discounting future cash flows. Kaplan and Ruback (1995) use the EBITDA multiple with comparable companies (in the same industry), comparable transactions, and comparable transactions in the same industry as benchmarks. Results of Kaplan and Ruback (1995) suggest that the EBITDA multiple estimates value just as well as the discounted cash flow model if benchmarks are based on comparable transactions or comparable transactions within the same industry. Hotchkiss and Mooradian (1998) examine a sample of 55

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19 These restrictions include: (1) seventy-five percent of the assets must consist of real estate mortgages, real estate equities, cash, or government securities (2) at least seventy-five percent of income must be derived from rents, mortgages, and gains from real estate sales (3) at least ninety percent of the taxable income must be distributed to shareholders each year and (4) no more than 50 percent of REIT shares must be held by five or fewer individuals during the last half of a taxable year.

bankruptcy filings from October 1979 to December 1992 that were eventually acquired by public companies. Hotchkiss and Mooradian (1998) use enterprise value to sales and enterprise value to assets multiples to determine enterprise value of companies acquired while in bankruptcy filings. Gilson, Hotchkiss, and Ruback (2000) compare market value of firms that come out of Chapter 11 bankruptcy proceedings to value implied by projected cash flows and multiples (EBITDA). Their sample contains 63 such firms that filed for bankruptcy between 1979 and 1992. Gilson, Hotchkiss, and Ruback (2000) find that multiples based on EBITDA produce larger valuation errors than that of valuations based on projected cash flows. Kim and Ritter (1999) apply several multiples to value IPOs. These multiples include price-to-earnings, market-to-book, price-to-sales, enterprise value-to-sales, and enterprise value-to-operating cash flow. The sample of the study includes 190 domestic IPOs between 1992 and 1993. Kim and Ritter (1999) report that multiples using forecasted earnings perform better than multiples based on historical earnings. Berger and Ofek (2002) use the market-to-sales multiple to value segments of a diversified firm based on a sample of 356 acquisitions between 1980 and 1995. They determine a benchmark multiple based on stand-alone firm multiples in the same industry as the segment. Osmundsen, Asche, Misund, and Mohn (2005) examine the relationship between the enterprise value-to-debt-adjusted cash flow multiple and return on average invested capital for 11 international oil companies for the period 1997-2002.

In addition to the above research, there is also a growing list of studies that focus on establishing the accuracy of multiples. Baker and Ruback (1999) examine the accuracy of EBITDA, EBIT, and Revenue multiples for the S&P 500 Index constituents in 1995. The results of Baker and Ruback (1999) suggest that the EBITDA multiple provides the best estimates among three multiples considered. The accuracy of the EBITDA multiple seems to be consistent across industries. Cheng and McNamara (2000) examine the accuracy of price-earnings and price-book and a combination of price-earnings and price-book multiples using a sample of firms from 1973 to 1992. Cheng and McNamara (2000) find that the combined multiple of price-earnings and price-book with industry level comparables provide the most accurate estimates. Lie and Lie (2002) examine how various valuation multiples perform in estimating value of companies in a broader context. Their data set includes 8,621 companies from COMPUSTAT with data for the fiscal year 1998 with earning forecasts for the fiscal year 1999. Lie and Lie (2002) establish benchmark multiples as the median of comparable firms within the same three-digit SIC code. Lie and Lie (2002) results generally find negatively biased value estimates suggesting that multiples underestimate the actual market value of companies. Median valuation errors are typically zero. They find that forecasted earnings and EBITDA multiples perform better than current earnings and EBIT multiples and that adjusting cash levels for enterprise value multiple does not improve accuracy. For financial companies, asset value multiples yield better results compared to sales and earnings based multiples. Liu, Nissim, and Thomas (2002) examine the accuracy of various multiples to determine their accuracy. Their sample includes 19,879 firm-year observations from 1982 to 1999. Liu, Nissim, and Thomas (2002) report that the forward earnings multiple performs best followed by the historical earnings multiple. Cash flow and book equity multiples perform similarly and the revenue multiple performs the worst. Their analysis across industries provides similar results. Liu, Nissim, and Thomas (2006) extend authors' previous work (Liu, Nissim, and Thomas (2002)) in several dimensions including the use of forecasted cash flows, dividends, individual industries, and cross border data. They confirm that the forward earnings multiple performs better than other multiples across industries and countries.

Yoo (2006) examines the accuracy of a combination of valuation multiples. Results suggest that a combination of historical multiples outperforms a single historical multiple; however, a combination of forward earnings and historical multiples is inferior to the forward earnings multiple alone. Schreiner and Spremann (2007) examine the accuracy of multiples in US and European markets. Their primary sample includes companies in the Dow Jones STOXX 600 Index. Schreiner and Spremann (2007) find that the equity value multiple and the two-year forward earnings multiple are superior to that of the entity multiple and trailing earnings multiple, respectively.

We contribute to this literature by examining the accuracy of well known and REIT specific valuation multiples in the REIT industry. REIT specific valuation multiples include funds from operations (FFO), adjusted funds from operations (AFFO), and net asset value (NAV). Block (2002) presents these variables as sources of value for REITs together with cash flow based valuation methods. There exist studies examining the performance of multiples at an industry level including Baker and Ruback (1999) and Liu, Nissim, and Thomas (2002). However, the Baker and Ruback (1999) sample is based on the S&P 500 Index that did not include any REITs in 1995 and the Liu, Nissim, and Thomas (2002) sample does not report results for REITs. We choose the REIT industry due to its unique nature and source of value. REITs may be viewed as closed-end funds that invest in real estate and report earnings in a different format than most other publicly owned companies. In addition, REITs must maintain certain qualifications to be exempt from corporate income taxation.

III. Data and Methodology
A. Data

The data for this research is obtained from SNL Financial and contains valuation related accounting variables based on regulatory filings, market price, and analyst estimates as of the end of 2007. These variables include: property concentration, price (P), earnings per share (E), forecasted earnings per share (FE), funds from operations (FFO), forecasted funds from operations (FFFO), adjusted funds from operations (AFFO), forecasted adjusted funds from operation (FAFFO), total assets (TA), book value of equity (BVE), number of common shares, cash and cash equivalents, earnings before interest and taxes (EBIT), earnings before interest taxes depreciation and amortization (EBITDA), net asset value (NAV), and total revenues (TR). Enterprise value (EV) is TA less BVE plus the product of price and number of common shares. Adjusted enterprise value (AEV) is EV less cash and cash equivalents (Cash). This adjustment is based on the notion that there is no reason to apply a multiple to value cash since its value is readily available.

We use adjusted enterprise value-to-book value of equity, adjusted enterprise value-to-EBIT, adjusted enterprise value-to-EBITDA, adjusted enterprise value-to-total revenues, enterprise value-to-book value of equity, enterprise value-to-EBIT, enterprise value-to-EBITDA, and enterprise value-to-total revenues.

Multiples used in REIT valuation include price-to-adjusted funds from operations, price-to-earnings, price-to-forecasted adjusted funds from operations, price-to-forecasted funds from operations, price-to-funds from operations, price-to-forecasted earnings, and price-to-net asset value.

Funds from Operations is computed using a method suggested by NAREIT as "FUNDS FROM OPERATIONS means net income (computed in accordance with generally accepted accounting principles), excluding gains (or losses) from sales of property, plus depreciation and amortization, and after adjustments for unconsolidated partnerships and joint ventures. Adjustments for unconsolidated partnerships and joint ventures will be calculated to reflect funds from operations on the same basis."20

AFFO is computed by making adjustments to FFO to make it more on a cash basis. These adjustments include deduction of capital improvement expenditures and amortization of debt principal, and accounting for variations in rent. The rent adjustment would reflect actual rent collections because the reported rental income is based on straight-line rent collection over leases and their terms. The data source for FFO, AFFO, and their forecasted values for fiscal year 2008 is SNL Financial.

A REIT's NAV is net value of equity investments in properties owned on a per share basis. This requires the estimation of private transaction value of properties owned by a REIT. Analysts use different methods to estimate NAV leading to variation in estimates. Typically, an analyst may estimate the value of a property by using the income capitalization approach where Net Operating Income (NOI) of subject property is divided by its capitalization rate. These individual property values are aggregated to determine the value of all properties owned by a REIT. Most NAV computations ignore the management's ability to create or destroy value. We use consensus NAV estimates as reported by SNL Financial in December 2007.

We compute benchmark valuation multiples using property type matches from SNL Financial and NAREIT. REIT property types and (number of REITs) within each group as reported by SNL Financial is as follows: Office (16), Multi-Family (14), Shopping Center (13), Health Care (12), Diversified (11), Hotel (11), Regional Mall (8), Specialty (8), Industrial (7), Manufactured Homes (4), Self Storage (4), Other (6). The total number of REITs is 114.

An alternative REIT property classification is also obtained from the January 2008 issue of "NAREIT REITWatch," for the month ending 12/31/2007.21 NAREIT property types and (number of REITs) within each group having financial data from SNL Financial is as follows: Office (14), Mixed – Office/Industrial (6), Industrial (6), Shopping Center (14), Regional Malls (7), Free Standing (5), Manufactured Homes (4), Apartments (14), Lodging/Resorts (11), Health Care (10), Diversified (8), Specialty (6), Self Storage (4), Hybrid (4). The total number of REITs is 113. Note that this count does not match the SNL Financial property type count because NAREIT REITWatch had no data on one REIT.

We also report results for broader property types that combine some of the property types based on NAREIT REITWatch classification. These types include (1) Industrial/Office including Office, Mixed – Office/Industrial, and Industrial, (2) Retail including Shopping

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20 This definition can be found at http://www.nareit.com/policy/accounting/whitepaper.cfm
21 This issue is available at http://www.reit.com/

Center, Regional Malls, and Free Standing, and (3) Residential including Manufactured Homes and Apartments.

Table 1 shows descriptive statistics for variables and multiples used in this research. The distribution of variables displays skewness similar to data used in previous research.

B. Methods

We first estimate the value of multiples for each REIT in the sample. Once the value of a multiple is determined for each REIT in the sample, we then determine the median value of each multiple using REIT property types as benchmarks. Lie and Lie (2002) require at least five three-digit SIC company matches to determine median benchmark multiples. The property type benchmarks for REITs include at least five REITs for most property types. The median value of a multiple for a property type group is the benchmark multiple to be used to estimate value of a REIT. Then the estimated value of a REIT is the product of the median multiple of comparable companies (benchmark multiple) based on property types and the relevant value source. For example, the estimated enterprise value of a REIT using the EBIT multiple is the product of benchmark enterprise value-to-EBIT and EBIT of subject REIT.

Similar to Lie and Lie (2002), we define valuation error as the natural logarithm of estimated value to market value.

$$\text{Valuation Error} = \ln\left(\frac{\text{Estimated enterprise value of subject REIT}}{\text{Enterprise value of subject REIT}}\right)$$

We report mean and median valuation errors as well as absolute valuation errors. Similar to previous studies, we also compute the fraction within 15% that is the number of valuation errors with a magnitude ±15% divided by the total number of estimates for a given multiple.

IV. Results

Table 2 shows the results of analysis for SNL Financial and NAREIT property type benchmarks across different multiples. It appears that the property type classifications by SNL Financial or NAREIT produce relatively similar results except for price-to-adjusted funds from the operations multiple. Similar to other studies, there is a general tendency to underestimate value considering the sign of mean valuation errors. The fraction of valuation errors with an absolute magnitude of 15% are between 17% and 43% across multiples excluding price-to-NAV. Enterprise value-to-EBITDA places about 43% of estimates within the 15% range when benchmarks are based on SNL Financial classification of property types.

The Panel B of Table 2 shows the results based NAREIT property type classification. The results are similar to panel in terms of the rankings of multiples, however, fractions within 15% are larger.

The results of Table 2 also suggest that historical or forward earnings based multiples are not useful for REITs contrary to finding of Liu, Nissim, and Thomas (2002 and 2006).

This should not be surprising since REIT earnings are not particularly informative about their prospects, however, multiples based on FFO do not perform well either.

Table 2 also reports valuation multiples based on price-to-NAV. Among all the valuation multiples, this particular multiple can place over 60% of companies within a 15% error range. This should not be all that surprising because the historical average REIT premium or discount to NAV is close to zero. However, there are also time periods in which premiums and discounts exceeded twenty percent. At the end of 2007, REITs were selling at a discount of about 3% on average according to Table 1. Note that 25th and 75th percentiles suggest there are REITs with premium-to-NAV exceeding 8.89% and REITs with discounts-to-NAV worse than 7.92%. If the data is available about the NAV estimates of the subject and comparable REITs, this multiple appears to produce value estimates that are quite close to actual market values.22

Among the three broader property type groups, it appears that the enterprise value-to-EBIT generates estimates that are more accurate for Residential REITs while enterprise value-to-EBITDA appears to be more accurate for Retail REITs. This may be due to distortions that depreciation and amortization expenses may have on Retail REITs EBIT. Removing these items appears to better approximate value. EBITDA and EBIT based multiples both perform well for the Industrial/Office group.

V.   Robustness Analysis

According to Baker and Ruback (1999) valuation errors are positively related to stock price making the harmonic mean superior to simple mean or median. The harmonic mean gives relatively low weights to firms with high stock prices since these firms would likely have high valuation errors. Therefore, we use the harmonic mean estimator when generating benchmark multiples to examine if previous results are sensitive to stock prices. We then compute the prediction error for the enterprise value similar to Liu, Nissim, and Thomas (2002) as

$$\text{Prediction Error} = \left(\frac{\text{Estimated enterprise value of subject REIT}}{\text{Enterprise value of subject REIT}} \right) - 1$$

The distributions of prediction errors across multiples are shown on Table 4. The results indicate that price-to-NAV and EBITDA based multiples still perform well. SNL Financial property type based benchmarks place 65% of REITs within 15% prediction errors. EBITDA based multiples produce prediction errors that has the smallest ranges from 25th to 75th percentile. These findings are similar regardless of property type classification source. Price-to-FFFO and price-to-FFO multiples perform better with the harmonic mean method, but they are still behind EBITDA based multiples.

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22 We replicate the Panel A of Table 2 using data from 2008 in light of the recent market downturn as recommended by reviewers. Although the accuracy of the multiples was lower, the ranking remained the same. For example, price-to-NAV was still the most accurate multiple placing 55% of REITs within 15% prediction errors. These results are available upon request.

VI.   Conclusion

This paper examines the performance of valuation multiples in the REIT industry. We find that price-to-NAV is the most effective multiple in REIT valuation. The availability of data may be a problem when using price-to-NAV since consensus NAV estimates are required. Price-to-NAV is followed by enterprise value-to-EBITDA and enterprise value-to-EBIT. We also find that adjusted enterprise value-to-EBITDA and EBIT produce relatively low valuation errors. Depending on the property focus of a REIT, enterprise value-to-EBIT performs better for Residential REITs, while enterprise value-to-EBITDA produces more accurate results for Retail REITs.

Table I. Descriptive Statistics

This table shows the valuation multiples evaluated for REITs. The data for this research is obtained from SNL Financial and contains valuation related variables based on regulatory filings, market price, and analyst estimates as of the end of 2007. These variables include: property concentration, price (P), earnings per share (E), forecasted earnings per share (FE), funds from operations (FFO), forecasted funds from operations (FFFO), adjusted funds from operations (AFFO), forecasted adjusted funds from operation (FAFFO), total assets (TA), book value of equity (BVE), number of common shares, cash and cash equivalents, earnings before interest and taxes (EBIT), earnings before interest taxes depreciation and amortization (EBITDA), net asset value (NAV), and total revenues (TR). Enterprise value (EV) is TA less BVE plus the product of price and number of common shares. Adjusted enterprise value (AEV) is EV less cash and cash equivalents (Cash).

Variable		Mean	Median	25%	75%
Cash and Cash Equivalents / Total Assets,	(Cash/TA)	0.0270	0.0084	0.0040	0.0215
EBITDA / Total Assets,	(EBITDA/TA)	0.0824	0.0828	0.0705	0.1001
EBIT / Total Assets,	(EBIT/TA)	0.0505	0.0513	0.0382	0.0652
Enterprise Value (000),	(EV)	5,364,761	3,010,652	1,364,266	6,439,801
Total Assets (000),	(TA)	3,911,736	2,164,951	1,055,833	4,890,760
Total Revenues (000),	(TR)	638,708	306,895	151,321	796,071
Adjusted Enterprise Value / Book Value of Equity,	(AEV/BVE)	5.5511	4.1285	3.1380	5.7478
Adjusted Enterprise Value / EBIT,	(AEV/EBIT)	33.1345	24.7196	20.3000	31.4220
Adjusted Enterprise Value / EBITDA,	(AEV/EBITDA)	15.0117	15.1011	12.8270	17.8894
Adjusted Enterprise Value / Total Revenues,	(AEV/TR)	9.9137	9.5535	7.1283	12.0772
Enterprise Value / Book Value of Equity,	(EV/BVE)	5.6641	4.2060	3.2170	5.7901
Enterprise Value / EBIT,	(EV/EBIT)	33.4490	25.0677	20.4963	31.5658
Enterprise Value / EBITDA,	(EV/EBITDA)	15.1338	15.2376	13.1363	17.9539
Enterprise Value / Total Revenues,	(EV/TR)	10.1404	9.8197	7.2293	12.4872
Price / Adjusted Funds From Operations,	(P/AFFO)	20.2602	14.6907	12.2808	21.3051
Price / Earnings,	(P/E)	1.7013	26.4989	14.3347	43.1818
Price / Forecasted Adjusted Funds From Operations,	(P/FAFFO)	4.0018	14.6045	11.6375	18.0513
Price / Forecasted Funds From Operations,	(P/FFFO)	12.7686	12.3126	9.6686	15.0689
Price / Funds From Operations,	(P/FFO)	13.7778	13.1557	9.9021	15.6486
Price / Forecasted Earnings,	(P/FE)	10.6006	26.4630	16.7188	41.2703
Price / Net Asset Value,	(P/NAV)	0.9671	0.9228	0.8314	1.0537

Table 2. Valuation Errors

This Table reports the valuation errors across multiples used in the study. In Panel A benchmarks multiples are established by using SNL Financial property type classification. Panel B is constructed in exactly the same manner, however, the benchmarks multiples are based on classification of REITs by NAREIT.

Measure	Adjusted Enterprise Value / Book Value of Equity, AEV/BVE	Adjusted Enterprise Value / EBIT, AEV/EBIT	Adjusted Enterprise Value / EBITDA, AEV/EBITDA	Adjusted Enterprise Value / Total Revenues, AEV/TR	Enterprise Value / Book Value of Equity, EV/BVE	Enterprise Value / EBIT, EV/EBIT	Enterprise Value / EBITDA, EV/EBITDA	Enterprise Value / Total Revenues, EV/TR	Price / Adjusted Funds From Operations, P/AFFO	Price / Earnings, P/E	Price / Forecasted Adjusted Funds From Operations, P/FAFFO	Price / Forecasted Funds From Operations, P/FFFO	Price / Funds From Operations, P/FFO	Price / Forecasted Earnings, P/FE	Price / Net Asset Value, P/NAV
Panel A. SNL Financial Property Type Benchmarks															
Mean	-0.0241	-0.0493	-0.0193	0.0078	-0.0304	-0.0556	-0.0232	0.0042	0.0128	-0.2786	-0.0015	-0.0205	-0.0040	-0.0657	0.0092
Median	-0.0168	-0.0042	-0.0202	-0.0117	-0.0201	-0.0096	-0.0158	0.0037	0.0027	-0.1841	-0.0204	-0.0218	-0.0176	-0.0871	-0.0053
Mean Absolute Error	0.4832	0.3166	0.2269	0.3019	0.4826	0.3127	0.2224	0.3057	0.4641	0.6216	0.2786	0.2882	0.3001	0.6044	0.1429
Median Absolute Error	0.3290	0.1959	0.1703	0.2309	0.3300	0.1898	0.1631	0.2352	0.3259	0.4168	0.2318	0.2655	0.2619	0.4477	0.1141
Fraction within 15%	0.2946	0.4444	0.4234	0.2655	0.2500	0.4444	0.4324	0.2743	0.2667	0.1739	0.3061	0.3232	0.2952	0.2192	0.6162
25th Percentile	-0.2919	-0.2124	-0.1918	-0.2326	-0.2973	-0.1977	-0.1992	-0.2352	-0.3460	-0.6570	-0.2082	-0.2655	-0.2536	-0.4603	-0.1141
75th Percentile	0.3712	0.1888	0.1589	0.2165	0.3718	0.1898	0.1522	0.2232	0.3057	0.1859	0.2629	0.2675	0.2619	0.3672	0.1144
Number of Observations	112	111	111	113	112	112	111	113	30	90	98	99	105	73	99
Panel B. NAREIT Property Type Benchmarks															
Mean	-0.0642	-0.0462	-0.0026	0.0175	-0.0690	-0.0516	-0.0029	0.0211	0.0047	-0.3194	-0.0063	-0.0179	0.0049	-0.0646	0.0092
Median	-0.0176	-0.0042	-0.0083	0.0000	-0.0125	-0.0096	-0.0009	-0.0070	0.0098	-0.1821	0.0026	-0.0023	0.0104	-0.0640	0.0095
Mean Absolute Error	0.5255	0.3236	0.2069	0.3022	0.5281	0.3181	0.1973	0.3029	0.4811	0.6803	0.2892	0.2954	0.2772	0.5888	0.1403
Median Absolute Error	0.3729	0.2098	0.1553	0.2341	0.3691	0.2015	0.1495	0.2413	0.3440	0.4316	0.2584	0.2655	0.2398	0.4495	0.1121
Fraction within 15%	0.2883	0.3604	0.4775	0.2589	0.2613	0.3784	0.5045	0.2768	0.1852	0.1556	0.3061	0.2828	0.3558	0.1944	0.6263
25th Percentile	-0.3535	-0.2134	-0.1511	-0.2269	-0.3539	-0.2058	-0.1255	-0.2382	-0.3469	-0.6630	-0.2310	-0.2655	-0.2267	-0.4678	-0.1144
75th Percentile	0.3783	0.2098	0.1606	0.2315	0.3880	0.2015	0.1545	0.2434	0.3057	0.2533	0.2669	0.2675	0.2558	0.3942	0.1108
Number of Observations	111	111	111	112	111	111	111	112	27	90	98	99	104	72	99

Table 3. Valuation Errors Across REIT Property Types

This Table reports the valuation errors across valuation multiples used in the study. In all panels, the benchmark multiples are based on classification of REITs by NAREIT. Panel A, B, and C report the valuation errors for three general property grouped by NAREIT. Industrial/Office, Retail, and Residential.

Measure	Adjusted Enterprise Value / Book Value of Equity, AEV/BVE	Adjusted Enterprise Value / EBIT, AEV/EBIT	Adjusted Enterprise Value / EBITDA, AEV/EBITDA	Adjusted Enterprise Value / Total Revenues, AEV/TR	Enterprise Value / Book Value of Equity, EV/BVE	Enterprise Value / EBIT, EV/EBIT	Enterprise Value / EBITDA, EV/EBITDA	Enterprise Value / Total Revenues, EV/TR	Price / Adjusted Funds From Operations, P/AFFO	Price / Earnings, P/E	Price / Forecasted Adjusted Funds From Operations, P/FAFFO	Price / Forecasted Funds From Operations, P/FFFO	Price / Funds From Operations, P/FFO	Price / Forecasted Earnings, P/FE	Price / Net Asset Value, P/NAV
Panel A. Valuation Multiples for Industrial/Office															
Mean	-0.0810	-0.0368	0.0184	0.0492	-0.0857	-0.0442	0.0228	0.0572	0.0240	-0.2126	-0.0271	-0.0131	-0.0007	-0.1425	-0.0103
Median	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1680	-0.1936	-0.0166	-0.0491	0.0000	-0.0991	0.0185
Mean Absolute Error	0.3815	0.3422	0.2433	0.3495	0.3827	0.3391	0.2314	0.3646	0.4476	0.8148	0.2558	0.2920	0.3340	0.6563	0.1589
Median Absolute Error	0.2505	0.1980	0.2506	0.3135	0.2655	0.1986	0.2310	0.3166	0.5620	0.5303	0.2522	0.2841	0.2656	0.5686	0.1044
Fraction within 15%	0.3462	0.3846	0.3846	0.0000	0.3462	0.3846	0.3846	0.0000	0.1250	0.0000	0.2917	0.1667	0.2692	0.1765	0.6800
25th Percentile	-0.2316	-0.2574	-0.2577	-0.3105	-0.2655	-0.2603	-0.2171	-0.3112	-0.5620	-0.7163	-0.2747	-0.3459	-0.2328	-0.4604	-0.0801
75th Percentile	0.2694	0.1820	0.2435	0.3321	0.2654	0.1807	0.2452	0.3902	0.4731	0.4098	0.2472	0.2587	0.2822	0.5686	0.1044
Number of Observations	24	26	26	26	26	26	26	26	8	23	24	24	26	17	25
Panel B. Valuation Multiples for Retail															
Mean	-0.2215	0.0250	-0.0274	-0.0127	-0.2284	0.0178	-0.0240	-0.0089	0.0622	-0.0095	0.0000	0.0153	0.0289	-0.0798	0.0203
Median	-0.1005	0.0000	-0.0277	0.0398	-0.1006	0.0000	-0.0030	0.0000	-0.3440	-0.0749	-0.0948	0.0000	0.0467	0.0293	0.0184
Mean Absolute Error	0.5125	0.2205	0.1858	0.2192	0.5280	0.2117	0.1759	0.2166	0.5228	0.3494	0.2889	0.3249	0.3052	0.4390	0.1297
Median Absolute Error	0.3592	0.1991	0.1560	0.2235	0.3710	0.1887	0.1257	0.2303	0.3469	0.3338	0.3009	0.3117	0.3210	0.3615	0.1123
Fraction within 15%	0.3333	0.3462	0.4615	0.3462	0.2917	0.4231	0.5769	0.3462	0.0000	0.1667	0.2400	0.2500	0.3077	0.2000	0.6250
25th Percentile	-0.5388	-0.1773	-0.2353	-0.2466	-0.5434	-0.1444	-0.1553	-0.2443	-0.3469	-0.3222	-0.2879	-0.2976	-0.3181	-0.4391	-0.1123
75th Percentile	0.2235	0.2098	0.0944	0.1825	0.2263	0.2015	0.0969	0.1849	0.8774	0.3508	0.3009	0.3168	0.3920	0.3449	0.1146
Number of Observations	24	26	26	26	24	26	26	26	3	24	25	24	26	20	24
Panel C. Valuation Multiples for Residential															
Mean	-0.1155	-0.1239	-0.0288	-0.0048	-0.1177	-0.1249	-0.0312	-0.0061	-0.0194	-0.8650	0.0197	-0.0247	0.0078	0.2769	0.0068
Median	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0461	-1.0907	0.0164	0.0442	0.0136	0.3925	0.0071
Mean Absolute Error	1.0558	0.3425	0.2413	0.2143	1.0554	0.3425	0.2418	0.2101	0.2814	1.1044	0.2981	0.3535	0.2825	0.9521	0.1054
Median Absolute Error	0.6453	0.1181	0.2074	0.2334	0.6404	0.1107	0.2053	0.2284	0.1644	1.0907	0.1758	0.2489	0.2566	0.5723	0.0401
Fraction within 15%	0.0000	0.6111	0.3333	0.3889	0.0000	0.6111	0.3333	0.3889	0.1429	0.2727	0.4375	0.3125	0.2941	0.0000	0.6875
25th Percentile	-0.8977	-0.1030	-0.2045	-0.2373	-0.9018	-0.0956	-0.2063	-0.2335	-0.3976	-1.5547	-0.1596	-0.2377	-0.2566	-0.5723	-0.0656
75th Percentile	0.6276	0.1437	0.2104	0.2296	0.6203	0.1449	0.2043	0.2232	0.1644	-0.0516	0.2172	0.2489	0.2319	0.7548	0.0250
Number of Observations	18	18	18	18	18	18	18	18	7	11	16	16	17	11	16

Table 4. Harmonic Mean Prediction Errors

This Table reports the valuation errors across multiples used in the study based on the harmonic mean method. In Panel A benchmarks multiples are established by using SNL Financial property type classification. Panel B is constructed in exactly the same manner, however, the benchmarks multiples are based on classification of REITs by NAREIT.

Measure	Adjusted Enterprise Value / Book Value of Equity, AEV/BVE	Adjusted Enterprise Value / EBIT, AEV/EBIT	Adjusted Enterprise Value / EBITDA, AEV/EBITDA	Adjusted Enterprise Value / Total Revenues, AEV/TR	Enterprise Value / Book Value of Equity, EV/BVE	Enterprise Value / EBIT, EV/EBIT	Enterprise Value / EBITDA, EV/EBITDA	Enterprise Value / Total Revenues, EV/TR	Price / Adjusted Funds From Operations, P/AFFO	Price / Earnings, P/E	Price / Forecasted Adjusted Funds From Operations, P/FAFFO	Price / Forecasted Funds From Operations, P/FFFO	Price / Funds From Operations, P/FFO	Price / Forecasted Earnings, P/FE	Price / Net Asset Value, P/NAV
Panel A. SNL Financial Property Type Benchmarks															
Mean	0.0476	0.1704	0.0457	0.0281	0.0483	0.1597	0.0435	0.0279	0.1037	-1.4924	0.0262	0.0164	0.0129	0.6488	0.0041
Median	-0.0572	0.0129	0.0308	-0.0764	-0.0625	0.0316	0.0274	-0.0750	0.0407	-0.0069	-0.0321	-0.0015	-0.0576	0.1149	-0.0313
Mean Absolute Error	0.4382	0.6133	0.3346	0.3214	0.4378	0.5918	0.3252	0.3201	0.4136	3.2990	0.3098	0.2804	0.2743	1.6662	0.1401
Median Absolute Error	0.3259	0.2460	0.1905	0.2238	0.3304	0.2316	0.1814	0.2261	0.2877	1.0488	0.2114	0.2434	0.2434	0.7180	0.1077
Fraction within 15%	0.2544	0.3246	0.4123	0.3333	0.2456	0.3333	0.4386	0.3509	0.2333	0.0877	0.3100	0.3400	0.3238	0.1446	0.6465
25th Percentile	-0.3241	-0.1816	-0.1389	-0.2402	-0.3220	-0.1839	-0.1399	-0.2375	-0.2925	-1.5749	-0.2013	-0.2147	-0.2274	-0.4711	-0.1132
75th Percentile	0.3324	0.3996	0.2183	0.1687	0.3464	0.3517	0.2163	0.1641	0.2829	0.6860	0.2411	0.2679	0.2580	0.8662	0.0911
Number of Observations	114	114	114	114	114	114	114	114	30	114	100	100	105	83	99
Panel B. NAREIT Property Type Benchmarks															
Mean	0.0616	-0.0507	-0.2770	0.0466	0.0608	-0.0475	-0.2294	0.0465	0.3853	-0.5211	0.0364	0.0206	0.0133	-0.7370	0.0052
Median	-0.0572	-0.0602	-0.0206	-0.0664	-0.0467	-0.0477	-0.0191	-0.0755	-0.0256	-0.0656	-0.0319	0.0063	-0.0347	0.0139	-0.0183
Mean Absolute Error	0.4642	0.5237	0.5712	0.3380	0.4621	0.5170	0.5195	0.3366	0.7222	3.4388	0.3245	0.2884	0.2670	3.0833	0.1429
Median Absolute Error	0.2959	0.2061	0.1815	0.2385	0.3044	0.1980	0.1661	0.2335	0.3576	0.9018	0.2379	0.2453	0.2198	0.6708	0.1089
Fraction within 15%	0.2655	0.3274	0.4336	0.3097	0.2566	0.3540	0.4425	0.3274	0.1852	0.0973	0.3100	0.3200	0.3365	0.1341	0.5859
25th Percentile	-0.3574	-0.2211	-0.1895	-0.2415	-0.3566	-0.2076	-0.1666	-0.2467	-0.3989	-1.0116	-0.2058	-0.2151	-0.2198	-0.4882	-0.1231
75th Percentile	0.2500	0.1771	0.1613	0.2116	0.2552	0.1909	0.1571	0.2216	0.3576	0.6999	0.2747	0.2675	0.2177	0.8465	0.0939
Number of Observations	113	113	113	113	113	113	113	113	27	113	100	100	104	82	99

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