How Accurate Are Commercial Real Estate Appraisals? Evidence from 25 Years of NCREIF Sales Data

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Abstract:

In this study, we provide new evidence on the performance measurement and reporting of commercial real estate returns. We do so by examining the accuracy of commercial-real-estate appraisals that occurred prior to the sale of properties from the NCREIF National Property Index ("NPI") during 1984 – 2010, a period which spans two up-and-down cycles of the market. We find that, on average, appraisals are more than 12% above, or below, subsequent sales prices that take place two quarters following the appraisal. Even in a portfolio context, allowing for offsetting positive and negative differences, appraisals are off by an average of 4% – 5 % of value, even after adjusting for capital appreciation during those two quarters. We also provide new evidence regarding how, and by how much, appraised values lag behind sales prices. We find that appraisals appear to lag the true sales prices, falling significantly below in hot markets and remaining significantly above in cold markets. This new evidence provides guidance to investors, regulators and others about how to interpret real-estate indices like the NPI that are based upon appraised values, in both a rising and falling market. Finally, we find that this "appraisal error" is largely systematic; we can explain more than half of the variation in the signed percentage difference in sales price and appraised value. Hence, appraisal errors are not due solely to property-specific heterogeneity.

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1. Introduction

As the commercial-real-estate industry emerges from the worst downturn since the crash of the early 1990s, the issues of performance measurement and reporting have once again taken center stage. Sales prices plummeted during 2008 and 2009, but what happened to the appraised values upon which investors rely for quarterly valuations? Did they accurately reflect the declines in value so readily observable in sales prices, or did they lag these declines, resulting in overvaluation within their portfolio and the NCREIF index?

In this study, we provide important new evidence on this issue by examining the accuracy of commercial-real-estate appraisals that occurred prior to the sale of properties from the portfolios of commercial-real-estate investors that contribute data to the NCREIF property database. By examining sales over the past 25 years covered by NCREIF, from 1984 – 2010, we are able to determine whether or not appraised values lag sales prices, and if so, by how much.

We provide new evidence regarding how much confidence an investor can place in the appraisal of a single property, as well as how much confidence an investor can place in the appraisals of a portfolio of properties. We find that, on average, an appraisal is more than 12% above, or below, subsequent sales prices that take place two quarters following the appraisal, even after adjusting for capital appreciation during those two quarters. Even in a portfolio context, allowing for offsetting positive and negative differences, appraisals are off by an average of 4% – 5 % of value.

We also provide new evidence on how well appraisals track the cycle of the commercial-real-estate market. We find that appraisals appear to lag the true sales prices, falling significantly below in hot markets and remaining significantly above in cold markets. The largest deviations are observed during the two peaks and two valleys of the past two cycles in the commercial real estate market. Not surprisingly, the worst performance occurred during the recent financial crisis. This new evidence provides guidance to investors about how to interpret appraised values, as well as property indices based upon those values, in both a rising and falling market.

Finally, we develop a model to explain the difference in sales price and appraised value. We find that this "appraisal error" is largely systematic, we can explain more than half of the variation in the signed percentage difference in sales price and appraised value. This is strong evidence that appraisal errors are not due solely to property-specific heterogeneity.

Our study is important because investors, regulators, and others rely upon appraised values to assess returns on the $11 trillion U.S. commercial-real-estate market because properties transact infrequently. The most widely used index of commercial-real-estate returns—NCREIF National Property Index ("NPI")—is based upon quarterly appraised values.[1]

In addition, more than $200 billion in pension-fund investments are held in private commingled-real-estate funds ("CREFs") as of the end of 2009; many of these CREFs are so-called "open" funds, where investors can buy in, and sell out, based upon the aggregate appraised values of fund properties. If appraised values differ materially from market values, then informed investors can, at least in theory, expropriate wealth from uninformed investors by moving in and

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[1] Researchers also have generated indices based upon transactions. See Hoag (1980); Miles, Cole and Guilkey (1990); Webb, Miles and Guilkey (1992); and Fisher, Gatzlaff, Geltner and Haurin (2003). The MIT Center for Real Estate produces a commercial real estate index based upon transactions of NCREIF properties that covers 1984 to the present.

out of these funds based upon their superior information. The larger the differential in appraised values and market values, the worse this problem becomes.

Finally, to the extent that firms managing the investments of pension funds benchmark their performance against the index, and use that benchmark to determine fees paid to them by investors, the overstatement or understatement of appraised values can lead to distortions in compensation.

2. Literature

There are several studies that have examined the reliability of commercial-real-estate appraisals, but most are now quite dated and rely upon information from only one cycle of the commercial-real-estate market. The first of these studies is Cole, Guilkey and Miles (1986), which examine 147 properties sold out of the NPI (formerly the Frank Russell Company, or FRC Index), during a period of rising prices from 1978 – 1984. These authors report that the average absolute difference in sales price and most recent independent appraisal was almost 9%.

Webb (1994) examines 569 properties sold out of the NPI during 1978 – 1992, including 152 sales prior to 1986 when commercial-real-estate prices were rising, 115 sales during 1986 – 1987 when prices were flat; and 302 sales during 1988 – 1992 when prices were falling. This study finds that the absolute difference in sales price and most recent independent appraisal averaged 13% prior to 1986, with this average falling to 9% – 10% during 1986 – 1990, and declining to only 7% in 1991 – 1992. It also finds that the simple difference in sales price and most recent appraisal is positive and significant during the time of rising prices, but is negative and significant during times of falling prices—strong evidence of a lag in appraised values relative to market prices.

Fisher, Miles, and Webb (1999) is the most recent study to visit this issue, examining 2,739 properties sold from the NPI during its first twenty years, from 1978 – 1998. These authors report that the average absolute percentage error falls within a range of 9% – 12.5%, reaching the low end of the range during 1986 – 1987, when the commercial-real-estate market was transitioning from appreciation to depreciation. They also report that the average percentage error was 2.64% over the entire period, but was positive during the up market, and negative during the down market. The worst performance was during 1991, when appraised values were, on average, 13.4% above sales prices.

3. Data and Methodology

3.1. Data:

Our data come primarily from the proprietary NCREIF property database. We collect information on quarterly appraised values, capital improvements and partial sales, as well as information on whether the appraisal was done in house or by an outside third-party appraiser. We collect fixed information on property characteristics, such as property type (office, retail, industrial, apartment, etc.), leverage, type of ownership (open fund, closed fund or separate account) and location. We collect the net and gross sales prices from the quarter in which the property was sold. We also collect information on cap rates from a survey conducted by the Real Estate Research Corporation (RERC); information on construction costs from the U.S. Census; and information on several measures of macro-economic activity including the unemployment rate, the level of gross domestic product and the 10-Year Treasury-bond rate from the FRED database of the Federal Reserve Bank of St. Louis.

We begin with 9,439 properties where data indicate that the property was sold during the period spanning 1982 Q1 through 2010 Q2. We limit our sample to the 8,281 sold properties that have been included in the NPI at some point during this period. Of these, we identify 7,575 as "true sales," which is defined by NCREIF as "full sale of the property." More than half of these sales have taken place since 1998—the last year analyzed by Fisher, Miles and Webb (1999). We find that our initial sample includes only 3 sales in 1982 and 5 sales in 1983, too few for meaningful analysis, so we drop these properties (one office and seven industrials) from our sample. We also find that our initial sample includes 105 hotel properties, also too few for meaningful analysis on an annual basis, so we also exclude these from our analysis sample. This leaves us with 7,462 properties, of which 1,517 are apartments, 2,556 are industrial, 2,142 are office and 1,247 are retail.

We find that 63 properties have no quarterly appraisal data prior to the sale date and are excluded from the analysis, leaving 7,399 properties. When we examine the most recent appraised value prior to sale date, we find that the appraised value is exactly equal to net sales price for 3,450 sold properties—almost half of the sample. This happens when managers substitute the net sales price in place of the value from an actual appraisal, which often occurs when a sale is pending and contract terms are known. Consequently, we focus our attention on the second appraisal prior to sale date. This forces us to delete an additional 185 properties for which we have appraisal data for only one quarter prior to sale, and leaves us with our final analysis sample of 7,214 sales with data covering at least two quarters prior to sale. [2]

Table 1A shows the number of properties and appraised value for the total NPI and for our annual samples of properties sold out of the NPI. During the sample period, the percentage of

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[2] As we move to three and four quarters prior to sale, we lose an additional 242 and 209 properties, respectively, that have only two or three appraisals available prior to sale date.

properties sold out of the NPI each year ranges from a low of 3.5% in both 1984 and 1985 to a high of 17.2% in 1998. There are two periods where annual sales exceed ten percent of the number of NPI properties—during 1996 – 1999 and 2002 – 2007. There also are two periods where the value of annual sales exceeds ten percent of the value of the NPI portfolio—during 1996 – 1997 and 2004 – 2005.

As shown in Table 1B, our final sample consists of 2,085 office properties, 1,220 retail properties, 1,436 apartment properties, and 2,473 industrial properties. With the exception of 1984 and 1985, each year contains at least one percent of our sample, but this percentage rises dramatically in 1996 to more than four percent and reaches a peak in 2005 at more than ten percent of sales, before dropping dramatically in 2008. Similar trends are evident by property type.

The average property in our analysis sample of 7,214 was included in the NPI for only 17.4 quarters, with a median of 14 quarters. This average is shortest for apartments at 14.9 quarters and longest for industrials at 18.8 quarters, with office and retail coming in at 17.2 and 17.4 quarters, respectively.

3.2. Methodology

Many properties report significant capital improvements during the four quarters prior to sale date. It is important to adjust appraisals occurring during these quarters to account for subsequent capital improvements; otherwise, we will observe large differences in the appraised values and subsequent sales prices that are attributable to these capital improvements rather than to appraisal error.

A second confounding effect is the capital appreciation that occurs between the date of appraisal and the subsequent date of sale. Without any adjustment, we would expect the appraised value to be less than or greater than sales price by the amount of capital appreciation during the period from appraisal date to sales date. This is especially important during quarters such as early 2009, when capital depreciation was in excess of five percent. To account for this effect, we calculate an alternative series of sales prices that are "rolled back" from the sales date to the appraisal date using an estimate of capital appreciation for each property type and quarter. More specifically, for each property in each quarter, we calculate:

Capital Appreciation $_{i, t-0}$

$= [(End\ Market\ Value_{i, t-0} + Partial\ Sales_{i, t-0} - Capital\ Improvement_{i, t-0})$

$\div (End\ Market\ Value_{i, t-1})] - 1$ (1)

where:

End Market Value $_{i, t-0}$ is the ending market value (appraised values or sale price) reported for property i during quarter t;

Partial Sales is the value of any partial sales reported for property i during quarter t; and

Capital Improvement $_{i, t-0}$ is the value of any capital improvement reported for property i during quarter t.

We then calculate:

Capital Appreciation $_{j,\,t\text{-}0}$ as the value-weighted average of capital appreciation reported for property type *j* during quarter *t*.

We "roll back" the sales price by discounting it by one plus the value-weighted average capital appreciation for that property type and quarter. For the 3,450 properties where the appraisal, one quarter prior to sale, is exactly equal to net sales price, we do not adjust for capital appreciation between the sale date and the one-quarter-prior appraisal, but do adjust for capital appreciation during the previous quarter. So, for comparison with the two-quarter-prior appraisal, we calculate the discounted net sales price at time $t - 0$ as:

Discounted Net Sales Price $_{i,\,t-0}$

$= $ *Net Sales Price $_{i,\,t-0}$* $\div$ (1 + *Capital Appreciation $_{i,\,t-1}$*)   (2)

For the remaining 3,943 properties where the one-quarter-prior appraisal differs from net sales price, we adjust capital appreciation during the partial quarter between sale date and the date of the one-quarter-prior appraisal, as well as appreciation during the previous quarter:

Discounted Net Sales Price $_{i,\,t-0}$

$= $ *Net Sales Price $_{i,\,t-0}$*

$\div$ [(1 + *K* $\times$ *Capital Appreciation $_{i,\,t-0}$*) $\times$ (1 + *Capital Appreciation $_{i,\,t-1}$*)]   (3)

where *K* is the number of days between the sale date and one-quarter prior appraisal divided by 90, i.e., the fraction of the quarter during which appreciation took place.

We present results for both the unadjusted and adjusted differences in sales price and appraised value. In most quarters, the median value of capital appreciation is zero, so that the unadjusted differences are better indicators of the accuracy of the appraisal for a single property

while the adjusted differences are better indicators of the accuracy of the appraisal for a property held as part of a portfolio of properties.

3.21 Univariate Tests

To measure the accuracy of an appraisal, we calculate the difference in the appraised value and the subsequent transaction price.

Percentage Appraisal Error $_i$

$= [Transaction\ Price_{i,\ t-0} - Appraised\ Value_{i,\ t-2}] / Appraised\ Value_{i,\ t-2}$ (4)

where:

Percentage Appraisal Error $_i$ is the percentage difference in the transaction price for property *i* during quarter $t - 0$ and the appraised value during quarter $t - 2$;

Transaction Price $_i$ is the transaction price for property *i* during quarter $t - 0$; and

Appraised Value $_{i,\ t-2}$ is the appraised value for property *i* during quarter $t - 2$ preceding the sale of property *i* during quarter $t - 0$, adjusted for any capital improvements and partial sales recorded during quarter $t - 1$.

When we calculate the average percentage appraisal error, positive and negative values cancel out; this average provides a misleading indicator of accuracy for any single property. However, an investor in a portfolio of properties, such as a CREF, *is* interested in the value of the portfolio rather than in the values of individual properties in the portfolio; for such an investor, the average percentage appraisal error *is* informative for these investors. Similarly, investors interested in using an index such as the NPI are more concerned with the accuracy of the portfolio valuation than with the valuation of individual properties.

We also can use the average of this measure to determine if the appraised value is an unbiased predictor of sales price; if such is the case, then the average percentage appraisal error

would be not significantly different from zero. Alternatively, if the appraised value is a biased predictor of sales price, as we would expect if appraisals lag true market values, then we would expect that the average percentage error is positive during periods of rising prices and negative during periods of falling prices, but may approximate zero during periods when prices are flat.

To better assess the accuracy of appraisals in predicting *individual* sales prices, we calculate an alternative measure of appraisal error—the absolute percentage appraisal error:

Absolute Percentage Appraisal Error $_i$

$$= ABS \; [\textit{Transaction Price}_{i, t-0} - \textit{Appraised Value}_{i, t-2}] \, / \, \textit{Appraised Value}_{i, t-2} \qquad (5)$$

where:

ABS is the absolute-value operator, and other terms are as previously defined.

Webb (1994) reports that the average absolute percentage appraisal error narrowed during the first 15 years of the NPI; in contrast, Fisher, Miles and Webb (1999) report that this measure actually widened during the 1990s. We provide new evidence regarding whether this trend continued, or was reversed during the most recent 10 years of the NPI.

We also examine the accuracy of "inside" appraisals relative to "outside" appraisals. Many property managers use their own staff to appraise properties in most quarters, and only hire an outside appraiser once per year. The NCREIF database includes a variable that identifies appraisals as "inside" or "outside" so we are able to distinguish between the two types of appraisals. [3]

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[3] A number of managers do not appraise properties on a quarterly basis. The indicator variable for inside or outside appraisal also includes a third value indicating "no appraisal."

3.22 Multivariate Tests

Finally, we investigate determinants of the percentage appraisal error, both at the

aggregate level and at the property level. First, we construct quarterly time series of average

percentage appraisal errors by averaging the percentage appraisal errors of properties that sell in

each quarter. We then estimate an ordinary-least-squares regression model:

$$\textit{Average Percentage Appraisal Error}_t = \sum \beta_j * \textit{Explanatory Variables}_{j,t} + \varepsilon_t \qquad (6)$$

where:

Average Percentage Appraisal Error$_t$ is the quarterly average of either the property-level

percentage appraisal error or the property-level absolute percentage error as defined

above in eq. (4) and eq. (5), respectively, for properties that sold during period t;

Explanatory Variables$_{j,t}$ is a vector of explanatory variables measured in period t and

thought to explain the average percentage appraisal error in period t;

β_j is the coefficient on explanatory variable i and

ε_t is a random error term.

In order to choose our explanatory variables, we look to the appraisal process for reasons

why appraisals would be expected to deviate from subsequent sales prices. In a typical appraisal,

there are three approaches to estimating value: the cost approach, the income approach and the

sales-comparison approach. In implementing each of these approaches to valuing a commercial

property, an appraiser relies upon differing sets of input data.

For the income approach, the appraiser relies upon income from the property being

valued and a cap rate. If rents are changing rapidly, then an appraiser relying upon existing rent

rolls would be expected to undervalue a property in a rising market and overvalue a property in a

falling market. We include the four-quarter change in quarterly *NPI Income Return* to capture

this potential source of error. Similarly, if cap rates are changing rapidly, then an appraiser

relying upon stale cap rates would be expected to undervalue a property in a rising market and

overvalue a property in a falling market. We include an estimate of the four-quarter change in the

quarterly *RERC Pre-Tax Yield (IRR)* as a proxy for the cap rate to capture this potential source of

error.[4]

For the sales-comparison approach, the appraiser relies upon comparable sales. If

property values are changing rapidly, then an appraiser relying upon transaction data would be

expected to undervalue properties in a rising market and undervalue properties in a falling

market. To capture this, we include the quarterly *NPI Appreciation Return* to capture this

potential source of error. In addition, when properties are transacting more frequently, more

timely comparable sales should be available. To capture this, we include the quarterly *Number of

Sales of NPI Properties* as a measure of market liquidity.

For the cost approach, the appraiser relies upon information about the input costs for

building a replacement of the property. If input costs are changing rapidly, then an appraiser

relying upon stale cost data will undervalue properties when costs are rising and over-value

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[4] We obtained the Pre-Tax Yield (IRR) for All Property Types from the Real Estate Research
Corporation (RERC) for 1993 Q1 – 2010 Q2. Because our data begin as of 1984 Q1, we
developed a model of the Pre-Tax Yield as a function of macro-economic variables that are
available going back to 1984. Our model, which must remain confidential in order for us to
comply with the terms of our use of the RERC data, explains more than 90% of the variability in
the Pre-Tax Yield over the 1993 – 2010 period. We then construct a measure of the change in the
Pre-Tax Yield that explains more than 50% of the variability in the four-quarter change in the
Pre-Tax Yield. We use this measure as our proxy for changes in the cap rate.

properties when values are falling. We include the four-quarter change in the U.S. Census'

Bureau's quarterly *Construction Cost Index* to capture this potential source of error.[5]

We also investigate the determinants of the percentage appraisal error at the property

level. We estimate the following ordinary-least-squares regression model:

$$\textit{Percentage Appraisal Error}_i = \sum \beta_j * \textit{Explanatory Variables}_{i,j} + \varepsilon_i \quad\quad (7)$$

where:

Percentage Appraisal Error $_i$ is either the difference or absolute difference in sales price

and two-quarter prior appraised value, adjusted for capital gains, for property *i*;

Explanatory Variables $_{i,j}$ is a vector of explanatory variables measured for property *i* and

thought to explain the percentage appraisal error;

β_j is the coefficient on explanatory variable *j* and

ε_i is a random error term.

As explanatory variables, in addition to those included in our previous model, we include the

following. First, we expect that there is a pecking order in the difficulty of accurately appraising

properties, where *Office* is most difficult, followed by *Retail*, *Apartments* and *Industrials*. We

include indicators for three of these four types, with *Industrials* being the omitted category.

Second, we expect that appraisals of levered properties would be less accurate because

valuations reported to NCREIF are as if unlevered; if there is favorable or unfavorable financing

involved in a transaction, then we would expect greater differences in sales prices and appraised

values. We included an indicator for *Levered* properties, *Unlevered* being the omitted category.

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[5] We use the "Constant Quality (Laspeyres) Price Index of New One-Family Houses Under Construction" (2005 base year), which we obtained from the website of the U.S. Census at: http://www.census.gov/const/www/constpriceindex.html.

Third, we expect external appraisals to be more accurate than internal appraisals, and internal appraisals to be more accurate than no appraisals. Consequently, we include indicator variables for *External Appraisal* and *Internal Appraisal*; *No Appraisal* is the omitted category.

Fourth, we expect type of ownership to influence appraisal accuracy. Accuracy is much more important for open-end funds (including the ODCE funds), where fund owners can buy in and out on the basis of appraised values, than it is to closed-end funds and separate accounts. Consequently, we include an indicator variable for *Open-End* funds, *ODCE* funds, and *Closed-End* funds and *Separate* Accounts being the omitted categories. We expect a negative coefficient for *Open-End* and *ODCE* and an insignificant coefficient for *Closed-End*.

4. Results

4.1. Descriptive Statistics for the Equal-Weighted Percentage Difference

Table 2A presents descriptive statistics for the equally weighted percentage differences in sales price and appraised values two quarters prior to the sale date calculated across all property types. Statistics are presented annually by date of appraisal on both an unadjusted and an adjusted basis, where the adjustment rolls back sales price by the percentage capital gain from time of the appraisal until the time of the next quarter. For each year, the table shows the median, mean, and standard error, as well as a *t*-statistic for the null hypothesis that the mean difference is zero, indicating that the appraisal is an unbiased estimate of the sales price.

For the full sample, the unadjusted median and average percentage differences are 2.8% and 4.9% respectively, indicating considerable positive skewness in the distribution. The t-statistic is 19.1, indicating with high confidence (significant at better than the 0.001 level) that

the true mean is significantly greater than zero, and meaning that the appraised value is a biased predictor of subsequent sales prices.

When we examine the annual differences, we find that the average for the full sample period hides considerable variability as the commercial real estate industry suffered through two massive down cycles, first during 1988 – 1993, and again during 2008 – 2009. During these down cycles, quarterly capital appreciation on the NPI was negative for at least nine consecutive quarters, cumulating to losses of 38.3% and 37.6%, respectively (See Appendix Table 1).[6] Also during each of these down cycles, the average annual differences in sales price and two-quarter-prior appraisal were significantly negative, indicating that prices were significantly lower than prior appraisals. From 1988 through 1993, these differences were between -2.5% and -8.9% and each was statistically significant at better than the 0.01 level. For 2008 and 2009, the differences were -12.0% and -8.9%, again statistically significant at better than the 0.01 level. We also see two periods where the average annual differences in sales price and two-quarter-prior appraisal were significantly positive, indicating that sales prices were significantly greater than prior appraisals. From 1996 through 1999, these differences were between 2.9% and 9.8%; from 2002 through 2007, these differences ranged between 3.4% and 14.7%. Each of these differences is statistically significant at better than the 0.01 level.

In the right side of Table 2A are the results where we adjust for capital gains during the period between the two-period-prior appraisal and the sales date. As we would expect, this adjustment reduces the magnitudes of the differences between sales price and two-quarter-prior appraisal, but not by much and the adjustment does not qualitatively affect our findings based

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[6] There also was a mild down cycle during 2001 – 2002, when losses cumulated to only 3.6%. Interestingly, the losses during 2008 – 2010 almost exactly equal the 38.6% cumulative gain during 2004 – 2007.

upon the unadjusted differences. We still find the same four periods where sales price significantly deviates from appraised values—the two "ups" and two "downs" in the market.

To summarize the results in Table 2A, we find strong evidence that the two-quarter prior appraised value is a biased estimate of sales price, that the direction of bias is downward in up markets but upward in down markets; and that the magnitude of the bias is greater in hotter and colder markets. This is consistent with the hypothesis that appraisals are lagged indicators of value and that they are not independent of prior appraisals.

Table 2B presents descriptive statistics for the equal-weighted percentage difference in sales price and two-quarter-prior appraised value by property type, with adjustments for capital appreciation. For the full sample, the average percentage difference is largest for Retail and Apartment properties at 5.3% and is smallest for Industrial properties at 2.1%, with Office properties in between at 4.2%. Once again, however, the full-sample averages mask considerable variability, not only across years but also across property types. During 2009, for example, the average percentage difference for industrial properties was -8.5% while that for Retail properties was +4.5%. During 2004, the average percentage difference for Retail properties was 15.2% while that for Office properties was only 6.6%. And during 1997, the average percentage difference for Retail properties was 5.7% while that for Office properties was 13.1%. In general, there are large errors across the four property types.

4.2. Descriptive Statistics for the Value-Weighted Percentage Difference

While the results in Tables 2A and 2B are valid for the valuations of individual properties, most institutional investors are more concerned with the results for portfolios of properties, where a larger property gets greater weight than a smaller property. In Tables 3A and

3B, we recalculate the percentage differences in sales price and two-quarter-prior appraisals but weighting each property by its appraised value.

For the full sample across all property types, the unadjusted median and average percentage differences (shown in Table 3A) are 4.2% and 6.7%, respectively, again indicating considerable positive skewness in the distribution. The t-statistic is 30.8, indicating with high confidence (significant at better than the 0.001 level) that the true mean is significantly greater than zero, and meaning that the appraised value remains a biased predictor of subsequent sales prices. Moreover, the magnitude of the median and average percentage differences increased by statistically significant amounts. This is evidence that the bias in appraisals is greater for larger properties than for smaller properties.

The adjusted median and average percentage differences are 3.2% and 5.5%, respectively, significantly smaller than the unadjusted value-weighted differences, but roughly double the comparable figures for the equally weighted percentage difference. Again, in Table 3, we see the same four episodes where sales price differs significantly from two-quarter-prior appraised value: 1990 – 1993 and 2008 – 2009, when sales prices were significantly lower than prior appraisals; and 1996 – 2000 and 2002 – 2007, when sales prices were significantly greater than prior appraisals.

In summary, the results in Table 3A for the value-weighted percentage difference in sales price and two-quarter appraised value provide even stronger evidence of bias and appraisal lag than do the results for the equally weighted percentage difference that appear in Table 2A. Sales prices lead appraisals in upward hot and downward in cold markets.

We also point out that our results for 1995 – 1998 are largely consistent with those reported by Fisher, Miles and Webb (1999). Like us, they find that value-weighted percentage

differences in sales price and prior appraised value were negative during 1988 – 1991 and positive during 1996 – 1998; however, they do not provide formal test statistics for ascertaining whether or not their differences are statistical significance. Our results provide this statistical evidence and show similar findings for the period from 1999 – 2010, but with differences almost double in magnitude.

In Table 3B, we break down the value-weighted results by property type, as we did in Table 2B for equal-weighted results. As in Table 2B, we again see considerable variability across property types, especially during the peaks and valleys of the real estate cycles.

4.3. Descriptive Statistics for the Equal-Weighted Absolute Percentage Difference

As large as the appraisal errors are as reported in Tables 2 and 3 for the accuracy of commercial real estate appraisals, the results in those two tables are based upon the average signed percentage difference, where positives and negatives cancel each other out, as they would in a portfolio context. In this section and the next, we analyze descriptive statistics for the absolute percentage difference, which provides a much better measure of the accuracy of an appraisal on an individual property. These results show even larger appraisal errors.

Table 4A presents descriptive statistics for the equally weighted absolute percentage difference in sales price and two-quarter prior appraised value, both unadjusted and adjusted for capital gains between the appraisal and sale dates and calculated across all property types. For the full sample, the adjusted median and average absolute percentage differences are 8.1% and 12.5%. While *t*-statistics are not appropriate for testing the distribution of this variable, which is bounded on the left by zero, they are still instructive. For the full sample, the t-statistic is 60.7, indicating that the mean is measured with high precision. The average absolute deviation of

12.5% is relatively close to the 10.8% statistic reported by Fisher, Miles and Webb (1999) for the 1980 – 1998 period.

Once again, however, the average over the full sample period masks considerable variability across sub-periods. The absolute difference was in single digits during 1984 – 1986 and again during 1999 – 2001. The absolute difference peaks during the 2004 – 2006 period, when it is consistently in excess of 16%. There is considerable skew in the distribution, as evidenced by the difference in the mean and median; however, the median absolute difference also reaches double digits during the 2004 – 2006 bubble years and again during the 2008 – 2009 crisis years.

Table 4B breaks down the results for the equally weighted absolute percentage difference by property type, adjusted for capital gains. Over the full sample period, the adjusted average absolute percentage difference is greatest for Office properties at 13.5% and smallest for Apartment properties at 11.0%. In general, each of the four property types tracks the overall differences for all properties, with correlations ranging from 0.62 for Apartment properties to 0.83 for Industrial properties.

4.4. Descriptive Statistics for the Value-Weighted Absolute Percentage Difference

Table 5A presents descriptive statistics for the value-weighted absolute percentage difference in sales price and two-quarter prior appraised value, without and with adjustments for capital gains between the appraisal and sale dates. Without adjusting for capital gains, the median and mean differences are 8.6% and 13.3%, respectively; with adjustments for capital gains, the median and mean differences fall to 7.7% and 12.4%, respectively. The worst results are for 2004 – 2006 and 2008 - 2009, when the median reached double digits. In general, the

results for the value-weighted absolute percentage difference are very similar to those for the equal-weighted absolute percentage difference, indicating that there is little difference in this measure of appraisal accuracy for large and small properties sold from the NPI.

Table 5B breaks down the results for the value-weighted absolute percentage difference by property type. Over the full sample period, the average absolute percentage difference is greatest for Office properties at 13.9% and smallest for Apartment properties at 10.9%. In general, there are few differences from the equal-weighted results in Table 4B. As with the equal-weighted results, each of the four property types tracks the overall differences for all properties, with correlations ranging from 0.58 for Apartment properties to 0.84 for Office properties.

4.5. Descriptive Statistics for Internal versus External Appraisals

One potential (and likely) explanation for the poor appraisal accuracy documented thus far is the simple fact that most property managers do not pay for an external "third-party" appraisal each quarter. Most managers perform such an appraisal only once per year, relying upon internal appraisals or no appraisals (where they simply carry forward the most recent appraised value, adjusting for capital improvements and partial sales) during interim quarters.

We investigate this potential explanation in Table 6A, where we split our sample of sold properties into these three groups and recalculate the percentage difference in sales price and two-quarter-prior appraised value. As shown in Table 6A, about half of our sold properties had no appraisal two quarters prior to sale, and about one quarter had internal appraisals and one quarter had external appraisals.

We expect to find that the adjusted average percentage difference is smaller for external appraisals than for internal appraisal and smaller for internal appraisals than for no appraisals. In fact, this is exactly what we find. The median percentage difference rises from 1.6% for external appraisals to 2.1% for internal appraisals and then to 4.7% for no appraisals. The mean percentage difference rises from 2.3% for external appraisals to 3.4% for internal appraisals and then to 8.1% for no appraisals. These results appear on their face to be encouraging: most of the bias documented in Table 2 is attributable to the lag in time between the most recent "real" appraisal and the sale date. When either an internal or external appraisal was conducted, the bias decreases by more than two-thirds. This suggests that, in a portfolio context, appraisals are relatively accurate.

However, when we examine the percentage differences across time, we find that bias remains a serious issue. For appraisals to be accurate in a portfolio context, pluses and minuses should cancel out across properties at the same point in time, not just across different points in time. What we see is that appraisal errors appear to be highly correlated across time and appear to lag changes in true market values. For example, the average percentage error for external appraisals plummets to -15.6% in 1990 and to -20.2% in 2008, but balloons to 16.2% in 2006.

Next, we look at the equal-weighted absolute percentage difference by appraisal type, shown in Table 6B. This gives us our best measure of appraisal accuracy for an individual property. For the full sample period across all property types, we find that the median absolute percentage error for external appraisals is 7.1%, which is slightly better than the 8.6% observed for no appraisals, but slightly worse than the 6.8% observed for inside appraisals. When we look at the mean, external, internal and no appraisals come in at 11.7%, 10.8% and 13.5%, respectively. Hence, we find that external appraisals are no more accurate than inside appraisals

and only slightly better than no update of the previous appraisal. All three are off by double digits.

Things are even worse when we look year by year. For external appraisals, the median absolute error is 15.2% for 2009 and the average is 20.6%. Both figures are appreciably worse than the comparable figures for inside or no appraisals. The average absolute error for external appraisals is greater than 10% in each year from 2002 – 2009 with the exception of 2007, when it was 9.1%.

4.6 Determinants of the Average and Average Absolute Percentage Appraisal Error

In Table 7, we present the results from two sets of ordinary-least-squares regressions where the dependent variables are the quarterly average percentage difference (Panel A) and the quarterly average absolute percentage difference (Panel B) in the sales price and two-quarter prior appraisal (equally weighted and adjusted for capital gains); the five explanatory variables are as described in section 3.22—the quarterly *NPI Appreciation Return,* the quarterly number of sales of NPI properties, the four -quarter change in the quarterly *NPI Income Return*, our cap-rate proxy for the four-quarter change in the quarterly RERC *Pre-Tax Yield (IRR)*, and the four-quarter change in the quarterly U.S. Census *Construction-Cost Index*.

In Panel A, our dependent variable is the signed percentage difference in sale price and appraised value. First, we sequentially enter each of the five explanatory variables to provide evidence on the explanatory power of each, and then we present a model including all five explanatory variables. We find that the coefficient on the *NPI Appreciation* return is positive and significant at better than the 0.01 level, explaining about seven percent of the variation in the dependent variable. As hypothesized, when property values are changing more rapidly, appraisal

errors are larger. Next, we find that the coefficient on the *Number of NPI Sales* is positive and significant at better than the 0.01 level, and explains more than 37 percent of the variability in the dependent variable. This is exactly the opposite of what we would expect if the number of sales is a measure of liquidity, indicating the availability of more comparable sales at any point in time. Instead, this is consistent with the number of sales as an indicator of market frothiness, where buyers over-pay for properties, bidding up prices beyond what appraisers deem reasonable. Our third variable—the four-quarter change in the *NPI Income* return –is negative but not significantly different from zero and, by itself, has zero explanatory power. We had expected a positive and significant coefficient if this variable were a proxy for unexpected changes in property income. Our fourth variable—our proxy for changes in cap rates—is negative and significant at better than the 0.01 level. This is consistent with our hypothesis that sales price would exceed appraised values in hot markets where cap rates are falling, and that appraised values would exceed sales prices in cold markets where cap rates are rising. Our final variable—the change in construction costs—is positive and significant at better than the 0.01 level. This is consistent with our hypothesis that sales prices would exceed appraised values in hot markets where construction costs are rising and that appraised values would exceed sales prices in cold markets where prices are falling. In the last column of Panel A are the results from a model that includes all five of our explanatory variables. Each of the variables except for quarterly *NPI Appreciation* return is statistically significant at better than the 0.05 level, and three are significant at better than the 0.001 level—*Number of NPI Sales*, *Chg. NPI Income Return* and *Chg. RERC Cap Rate*. The interpretations are the same as for the univariate results; the main difference is that *Chg. NPI Income* return becomes positive and highly significant in a multivariate model. This model explains more than 50 percent of the variability in our dependent

variable, indicating that appraisal error is large systematic rather than random. In other words, by accounting for the variables in this model, appraisers should be able to reduce the difference in sales prices and appraised values by taking into account these factors.

In Panel B, our dependent variable is the average absolute percentage difference in sale price and appraised value. Our explanatory variables are the same as in Panel A, except that we have taken the absolute value of each variable, consistent with the construction of our dependent variable. As in Panel A, we sequentially enter each of the five explanatory variables to provide evidence on the explanatory power of each, and then we present a model including all five explanatory variables. We find that the coefficient on the absolute NPI appreciation return is positive and significant at better than the 0.05 level, explaining about five percent of the variation in the dependent variable. As hypothesized, when property values are changing more rapidly, appraisal errors are larger. Next, we find that the coefficient on the *Number of NPI Sales* is positive and significant at better than the 0.01 level, and explains more than 11 percent of the variability in the dependent variable. As in Panel A, this is exactly the opposite of what we would expect if the number of sales is a measure of liquidity; instead, this is consistent with the number of sales as an indicator of market frothiness. Our third variable—the absolute four-quarter change in the NPI income return –is positive and significant at the 0.01 level, explaining about six percent of the variability in the dependent variable. Unexpected changes in property income are associated with larger appraisal errors. Our fourth variable—our proxy for changes in cap rates—is positive and significant at better than the 0.01 level, explaining more than twelve percent of the variability in the dependent variable. As in Panel A, this is consistent with our hypothesis that appraisal errors are larger when cap rates are changing more rapidly. Our final variable—*Chg. Constr. Cost* Index—is positive and significant at better than the 0.01 level.

Again, this is consistent with our hypothesis that appraisal errors are larger when construction costs are changing more rapidly. In the last column of Panel A are the results from a model that includes all five of our explanatory variables. Surprisingly, only one of the five variables is statistically significant at even the 0.05 level, whereas each of the five were significant in univariate regressions and four of the five at better than the 0.01 level. This is almost certainly attributable to multicollinearity among the five regressors, as this model explains about eighteen percent of the variability in the dependent variable, far more than any of the individual variables. While this model has far less explanatory variable than our model of the signed appraisal error, it still indicates that there is a large systematic component to the absolute appraisal error that could be reduced by accounting for the variables in this model.

4.7 Determinants of the Percentage Appraisal Error

Finally, we investigate determinants of the signed and absolute percentage appraisal error at the property level. In Table 8, we present the results from a series of ordinary- least-squares regressions where the dependent variable is the signed percentage difference (Panel A) or the absolute percentage difference (Panel B) in sales price and two-quarter-prior appraised value (adjusted for capital gains). The explanatory variables include the same five macro-economic variables that appear in Table 7, plus the set of property-level variables discussed in Section 3.22.

In Panel A are the results for the signed percentage appraisal error. For the five macro-economic variables, the results are not qualitatively different from those found for the average signed percentage appraisal error in Panel A of Table 7. Each variable except for the quarterly *NPI Appreciation* return is statistically significant; the *Number of NPI Sales* and change in *NPI*

Income return are both positive; and *Chg. RERC Cap Rate* and *Chg. Construction Cost* Index are negative. In other words, the property-level results confirm our findings for the quarterly average percentage appraisal error.

Among the property-level variables, our results largely confirm our hypotheses. First, we find that signed percentage appraisal errors are smaller for *Open-End* Fund properties, where accuracy is at a premium because fund participants can trade in and out of the funds based upon appraised values. Signed percentage appraisal errors for *Closed-End* Fund properties are not significantly different from those of the omitted category of *Separate-Account* properties. Second, signed percentage appraisal errors are significantly lower for *External* and *Internal* appraisals relative to the omitted category of *No Appraisal Indicated*. We had hypothesized that errors would be smallest for external appraisals, which are done by an independent third party, but this does not appear to be the case. This calls into question the justification for paying for such outside appraisals. Third, the signed percentage appraisal errors are larger for *Levered* properties relative to the omitted category of *Unlevered* properties. The values of levered properties that are reported to NCREIF are as if the property was unlevered, so this "unlevering" calculation appears to magnify any appraisal error. Fourth, signed percentage appraisal errors are largest for *Apartment* properties, followed by *Office* properties, *Retail* Properties and then the omitted category of *Industrial* properties. We had expected a similar pecking order, but with *Office* properties at the top, followed by *Retail*, *Apartment* and *Industrial* properties. Hence, it appears that appraisals of apartments are the most difficult for appraisers.

In Panel B are the results for the absolute percentage appraisal error. For the five macro-economic variables, all but *Chg. RERC Cap Rate* are statistically significant at the 0.01 level or better, and all five are positive. Hence, these results confirm the univariate results reported in

Panel B of Table 7 for the quarterly average absolute appraisal error. Once again, the big surprise is the positive coefficient on the *Number of NPI Sales*, indicating that it is a proxy for market froth rather than for market liquidity.

Among the property-level variables, our results for *External* appraisals, *Internal* appraisals and *Levered* properties are not qualitatively different from those in Panel A. Appraisal errors are smaller for external and internal appraisals relative to the omitted category of *No Appraisal Indicated*, but not different between *External* and *Internal*. Appraisal errors are significantly larger for *Levered* properties relative to the omitted category of *Unlevered* properties.

Results for fund type are different from the results in Panel A, in that we find no significant differences in the appraisal accuracy across funds. Results for property type also are different from those reported in Panel A. Here we find that appraisal errors are largest for *Office* properties, followed by *Retail* and *Industrial* properties, with *Apartment* properties having the smallest absolute errors.

5. Summary and Conclusions

In this study, we have analyzed the accuracy of commercial real estate appraisals using data from properties sold out of the NCREIF National Property Index during the last 25 years. Our findings are sobering. On average, appraisals are more than 12% above, or below, subsequent sales prices, and this results holds true for both external and internal appraisals. Even in a portfolio context where errors can cancel each other out, results are not appreciably better; appraisals are off by an average of 4% -5% of value because the under- and over-valuations are highly correlated across properties at the same points in time. In other words, errors don't

"average out." We also find that appraisals appear to lag the true sales prices, falling below in hot markets and remaining above in cold markets. The largest deviations are observed during the two peaks and two valleys of the past two cycles in the commercial real estate market. Not surprisingly, the worst performance occurred during the recent financial crisis.

We also model the difference in the sales price and prior appraisal. We find that this "appraisal error" is largely systematic; we can explain more than half of the variation in the signed percentage difference in sales price and appraised value. This is strong evidence that appraisal errors are not due solely to property-specific heterogeneity. Instead, our results offer guidance to appraisers on what factors to look to in adjusting for fast-changing market conditions.

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Appendix Table 1:
NPI Returns 1980 – 2010

This table presents returns on the NCREIF National Property Index over the period 1980 Q1 through 2010 Q2. Total return, income return and appreciation return are shown for each quarter.

Year-Qtr	Total	Income	Appreciation	Year-Qtr	Total	Income	Appreciation	Year-Qtr	Total	Income	Appreciation
1980Q1	5.5%	2.1%	3.5%	1990Q1	1.4%	1.6%	-0.2%	2000Q1	2.4%	2.0%	0.4%
1980Q2	2.4%	2.1%	0.3%	1990Q2	1.5%	1.6%	-0.1%	2000Q2	3.1%	2.1%	0.9%
1980Q3	3.8%	2.0%	1.8%	1990Q3	0.8%	1.6%	-0.7%	2000Q3	2.9%	2.1%	0.8%
1980Q4	5.3%	2.0%	3.3%	1990Q4	-1.4%	1.7%	-3.1%	2000Q4	3.3%	2.1%	1.2%
1981Q1	3.0%	1.9%	1.0%	1991Q1	0.0%	1.6%	-1.6%	2001Q1	2.4%	2.1%	0.3%
1981Q2	4.2%	2.1%	2.2%	1991Q2	0.0%	1.7%	-1.7%	2001Q2	2.5%	2.1%	0.3%
1981Q3	3.2%	1.9%	1.3%	1991Q3	-0.3%	1.6%	-2.0%	2001Q3	1.6%	2.1%	-0.5%
1981Q4	5.3%	1.9%	3.4%	1991Q4	-5.3%	1.7%	-7.0%	2001Q4	0.7%	2.1%	-1.4%
1982Q1	2.5%	1.9%	0.6%	1992Q1	0.0%	1.8%	-1.8%	2002Q1	1.5%	2.1%	-0.6%
1982Q2	2.1%	1.9%	0.1%	1992Q2	-1.0%	1.9%	-2.9%	2002Q2	1.6%	2.1%	-0.5%
1982Q3	1.5%	1.9%	-0.4%	1992Q3	-0.4%	1.8%	-2.3%	2002Q3	1.8%	2.0%	-0.2%
1982Q4	3.0%	2.0%	1.1%	1992Q4	-2.8%	1.9%	-4.7%	2002Q4	1.7%	2.0%	-0.3%
1983Q1	1.8%	2.0%	-0.3%	1993Q1	0.8%	2.0%	-1.2%	2003Q1	1.9%	2.0%	-0.1%
1983Q2	2.5%	2.0%	0.6%	1993Q2	-0.2%	1.9%	-2.2%	2003Q2	2.1%	2.0%	0.1%
1983Q3	3.0%	1.9%	1.1%	1993Q3	1.1%	2.0%	-0.9%	2003Q3	2.0%	1.9%	0.1%
1983Q4	5.3%	1.8%	3.5%	1993Q4	-0.3%	2.1%	-2.3%	2003Q4	2.8%	1.9%	0.9%
1984Q1	3.4%	1.8%	1.5%	1994Q1	1.3%	2.1%	-0.7%	2004Q1	2.6%	1.8%	0.7%
1984Q2	3.2%	1.9%	1.3%	1994Q2	1.5%	2.1%	-0.6%	2004Q2	3.1%	1.8%	1.3%
1984Q3	2.5%	1.8%	0.6%	1994Q3	1.5%	2.1%	-0.6%	2004Q3	3.4%	1.8%	1.6%
1984Q4	4.2%	1.9%	2.4%	1994Q4	1.9%	2.2%	-0.3%	2004Q4	4.7%	1.8%	2.9%
1985Q1	2.1%	1.8%	0.3%	1995Q1	2.1%	2.2%	-0.1%	2005Q1	3.5%	1.7%	1.8%
1985Q2	2.6%	1.9%	0.7%	1995Q2	2.1%	2.2%	-0.2%	2005Q2	5.3%	1.7%	3.7%
1985Q3	2.4%	1.9%	0.5%	1995Q3	2.1%	2.2%	-0.1%	2005Q3	4.4%	1.6%	2.8%
1985Q4	3.7%	1.8%	2.0%	1995Q4	1.1%	2.2%	-1.1%	2005Q4	5.4%	1.6%	3.8%
1986Q1	2.0%	1.8%	0.2%	1996Q1	2.4%	2.1%	0.3%	2006Q1	3.6%	1.5%	2.1%
1986Q2	2.0%	1.9%	0.1%	1996Q2	2.3%	2.2%	0.1%	2006Q2	4.0%	1.5%	2.5%
1986Q3	1.5%	1.8%	-0.3%	1996Q3	2.6%	2.1%	0.5%	2006Q3	3.5%	1.5%	2.0%
1986Q4	2.6%	1.8%	0.8%	1996Q4	2.6%	2.1%	0.5%	2006Q4	4.5%	1.5%	3.0%
1987Q1	1.8%	1.8%	0.1%	1997Q1	2.3%	2.1%	0.2%	2007Q1	3.6%	1.4%	2.2%
1987Q2	1.2%	1.8%	-0.6%	1997Q2	2.8%	2.2%	0.6%	2007Q2	4.6%	1.4%	3.2%
1987Q3	2.1%	1.8%	0.3%	1997Q3	3.4%	2.2%	1.2%	2007Q3	3.6%	1.3%	2.2%
1987Q4	2.7%	1.8%	0.9%	1997Q4	4.7%	2.2%	2.5%	2007Q4	3.2%	1.3%	1.9%
1988Q1	1.8%	1.7%	0.1%	1998Q1	4.1%	2.2%	1.9%	2008Q1	1.6%	1.3%	0.3%
1988Q2	2.0%	1.8%	0.2%	1998Q2	4.2%	2.1%	2.1%	2008Q2	0.6%	1.3%	-0.7%
1988Q3	2.4%	1.7%	0.7%	1998Q3	3.5%	2.1%	1.4%	2008Q3	-0.2%	1.2%	-1.4%
1988Q4	3.1%	1.7%	1.4%	1998Q4	3.6%	2.1%	1.5%	2008Q4	-8.3%	1.3%	-9.5%
1989Q1	1.8%	1.7%	0.1%	1999Q1	2.6%	2.0%	0.6%	2009Q1	-7.3%	1.4%	-8.7%
1989Q2	2.0%	1.7%	0.3%	1999Q2	2.6%	2.1%	0.5%	2009 Q2	-5.4%	1.5%	-6.9%
1989Q3	2.0%	1.6%	0.5%	1999Q3	2.8%	2.0%	0.8%	2009 Q3	-3.3%	1.6%	-4.9%
1989Q4	1.8%	1.6%	0.2%	1999Q4	2.9%	2.0%	0.9%	2009 Q4	-2.1%	1.6%	-3.7%
								2010 Q1	0.8%	1.7%	-0.9%
								2010 Q2	3.3%	1.7%	-0.8%

Table 1A:
Properties Sold from the NPI
1984 Q1 – 2010 Q2

This table shows the number and value of all properties in the NCREIF NPI portfolio along with the number and value of properties sold out of the NPI portfolio during each year from 1984 Q1 – 2010 Q2 and for which at least two quarterly appraisals are available prior to the sale date. Note that the statistics for 2010 are based upon only the first two quarters of that year.

Period	Total NPI Number	Value ($ Millions)	Sold from NPI Number	Pct.	Value ($ Millions)	Pct.
12/31/1983	989	9,025.0				
12/31/1984	1,060	11,476.0	37	3.5%	186.5	1.6%
12/31/1985	1,159	15,407.8	41	3.5%	139.8	0.9%
12/31/1986	1,253	17,870.9	90	7.2%	541.8	3.0%
12/31/1987	1,403	22,184.6	86	6.1%	598.1	2.7%
12/31/1988	1,536	28,470.9	118	7.7%	1,324.1	4.7%
12/31/1989	1,660	32,656.1	138	8.3%	1,413.8	4.3%
12/31/1990	1,877	37,970.8	109	5.8%	799.8	2.1%
12/31/1991	2,028	37,009.6	106	5.2%	1,322.7	3.6%
12/31/1992	2,233	39,499.3	87	3.9%	520.8	1.3%
12/31/1993	2,069	40,949.9	140	6.8%	1,289.8	3.1%
12/31/1994	1,970	41,030.8	165	8.4%	1,766.0	4.3%
12/31/1995	2,322	48,278.5	172	7.4%	2,168.0	4.5%
12/31/1996	2,378	54,424.1	307	12.9%	4,147.7	7.6%
12/31/1997	2,560	66,134.9	396	15.5%	7,028.1	10.6%
12/31/1998	2,440	67,352.9	420	17.2%	10,533.5	15.6%
12/31/1999	2,628	81,989.1	342	13.0%	7,176.6	8.8%
12/31/2000	3,028	97,634.8	283	9.3%	8,432.2	8.6%
12/31/2001	3,509	113,708.9	304	8.7%	7,236.3	6.4%
12/31/2002	3,681	122,621.4	372	10.1%	9,179.1	7.5%
12/31/2003	4,060	133,107.2	388	9.6%	10,094.4	7.6%
12/31/2004	4,151	146,535.2	580	14.0%	16,913.7	11.5%
12/31/2005	4,712	189,614.2	737	15.6%	22,639.4	11.9%
12/31/2006	5,332	247,285.3	602	11.3%	18,574.2	7.5%
12/31/2007	5,713	310,068.4	596	10.4%	22,372.7	7.2%
12/31/2008	6,285	305,276.4	230	3.7%	9,384.5	3.1%
12/31/2009	6,209	238,227.5	246	4.0%	6,515.1	2.7%
6/30/2010	6,066	234,484.6	122	2.0%	4,261.8	1.8%

Table 1B:
Properties Sold from the NPI
1984 Q1 – 2010 Q2

This table shows the number of NPI properties sold during each year from 1984 Q1 – 2010 Q2 and for which at least two quarterly appraisals are available prior to the sale date. Separate statistics are presented for all properties and for office, retail, apartment and industrial properties. Not included in totals are 105 hotel properties that were excluded from the analysis. Note that the statistics for 2010 are based upon only the first two quarters of that year.

YEAR	TOTAL		OFFICE		RETAIL		APT		INDUS	
1984	37	0.5%	17	0.8%	8	0.7%	0	0.0%	12	0.5%
1985	41	0.6%	7	0.3%	6	0.5%	1	0.1%	27	1.1%
1986	90	1.2%	23	1.1%	23	1.9%	2	0.1%	42	1.7%
1987	86	1.2%	25	1.2%	18	1.5%	1	0.1%	42	1.7%
1988	118	1.6%	24	1.2%	21	1.7%	7	0.5%	66	2.7%
1989	138	1.9%	41	2.0%	22	1.8%	6	0.4%	69	2.8%
1990	109	1.5%	42	2.0%	7	0.6%	3	0.2%	57	2.3%
1991	106	1.5%	40	1.9%	12	1.0%	7	0.5%	47	1.9%
1992	87	1.2%	25	1.2%	16	1.3%	8	0.6%	38	1.5%
1993	140	1.9%	42	2.0%	25	2.0%	33	2.3%	40	1.6%
1994	165	2.3%	40	1.9%	17	1.4%	36	2.5%	72	2.9%
1995	172	2.4%	55	2.6%	33	2.7%	29	2.0%	55	2.2%
1996	307	4.3%	96	4.6%	58	4.8%	51	3.6%	102	4.1%
1997	396	5.5%	93	4.5%	94	7.7%	74	5.2%	135	5.5%
1998	420	5.8%	121	5.8%	99	8.1%	71	4.9%	129	5.2%
1999	342	4.7%	94	4.5%	92	7.5%	59	4.1%	97	3.9%
2000	283	3.9%	93	4.5%	59	4.8%	56	3.9%	75	3.0%
2001	304	4.2%	75	3.6%	58	4.8%	94	6.5%	77	3.1%
2002	372	5.2%	96	4.6%	62	5.1%	89	6.2%	125	5.1%
2003	388	5.4%	115	5.5%	73	6.0%	87	6.1%	113	4.6%
2004	580	8.0%	159	7.6%	94	7.7%	108	7.5%	219	8.9%
2005	735	10.2%	216	10.4%	153	12.5%	161	11.2%	205	8.3%
2006	602	8.3%	183	8.8%	49	4.0%	147	10.2%	223	9.0%
2007	596	8.3%	200	9.6%	60	4.9%	130	9.1%	206	8.3%
2008	232	3.2%	77	3.7%	15	1.2%	65	4.5%	75	3.0%
2009	246	3.4%	57	2.7%	19	1.6%	80	5.6%	90	3.6%
2010	122	1.7%	29	1.4%	27	2.2%	31	2.2%	35	1.4%
Total	7,214	100.0%	2,085	100.0%	1,220	100.0%	1,436	100.0%	2,473	100.0%

Table 2A
Equally Weighted Percentage Difference in Sales Price and Appraised Value
This table presents statistics for the equally weighted percentage difference in sales price and appraised values two quarters prior to the sale date. Statistics are presented annually by date of appraisal on both an unadjusted and an adjusted basis, where the adjustment rolls back sales price by the average percentage capital gain from time of the appraisal until the time of sale. For each year, the table shows the median, mean, and standard error, as well as a *t*-statistic for testing the null hypothesis that the mean difference is equal to zero, indicating that the appraisal is an unbiased estimate of the sales price. *, **, and *** indicate that the mean is statistically different from zero at the 0.10, 0.05 and 0.01 levels, respectively.

Year	Obs.	Unadjusted for Capital Gains					Adjusted for Capital Gains				
		Median	Mean	S.E.	t-Stat		Median	Mean	S.E.	t-Stat	
Total	7,214	2.8%	4.9%	0.3%	19.1	***	1.9%	3.9%	0.2%	15.7	***
1984	44	-6.7%	-4.4%	1.3%	-3.4	***	-8.1%	-6.2%	1.3%	-4.9	***
1985	37	0.6%	0.7%	1.7%	0.4		0.1%	0.1%	1.7%	0.0	
1986	120	0.3%	0.3%	1.1%	0.2		-0.1%	0.0%	1.1%	0.0	
1987	93	-1.4%	-0.9%	1.9%	-0.5		-1.4%	-0.9%	1.9%	-0.5	
1988	125	-4.4%	-4.7%	1.6%	-2.9	***	-5.1%	-5.2%	1.6%	-3.2	***
1989	121	-3.8%	-5.9%	1.5%	-4.0	***	-5.0%	-6.1%	1.5%	-4.2	***
1990	136	-6.5%	-8.9%	1.1%	-8.2	***	-5.9%	-8.3%	1.1%	-7.7	***
1991	69	-6.3%	-7.3%	1.5%	-5.0	***	-3.8%	-5.4%	1.5%	-3.5	***
1992	111	-2.1%	-2.9%	1.6%	-1.8	*	-0.3%	-0.7%	1.7%	-0.4	
1993	149	0.0%	-2.5%	1.3%	-2.0	**	0.4%	-1.4%	1.3%	-1.1	
1994	197	0.1%	0.5%	1.5%	0.3		0.4%	0.3%	1.5%	0.2	
1995	173	0.3%	1.5%	3.6%	0.4		0.1%	1.1%	3.6%	0.3	
1996	393	1.4%	4.1%	1.0%	3.9	***	1.0%	3.4%	1.0%	3.3	***
1997	403	5.3%	9.8%	1.8%	5.3	***	4.4%	8.3%	1.8%	4.7	***
1998	409	5.5%	7.6%	0.7%	10.2	***	3.7%	5.5%	0.7%	7.5	***
1999	268	1.6%	2.9%	0.7%	4.4	***	0.7%	2.1%	0.7%	3.2	**
2000	317	0.6%	2.5%	1.4%	1.8	*	-0.6%	1.3%	1.4%	1.0	
2001	310	0.8%	1.7%	0.7%	2.3	**	0.9%	1.7%	0.7%	2.3	**
2002	383	2.1%	3.4%	0.7%	4.6	***	2.0%	3.5%	0.7%	4.7	***
2003	456	4.1%	4.8%	0.8%	6.1	***	3.7%	4.3%	0.8%	5.5	***
2004	717	11.6%	12.0%	0.7%	17.1	***	9.7%	10.0%	0.7%	14.6	***
2005	697	11.6%	14.7%	0.8%	18.4	***	7.7%	10.6%	0.8%	13.7	***
2006	606	10.8%	14.5%	0.9%	16.9	***	8.1%	11.6%	0.8%	13.8	***
2007	397	2.8%	4.9%	0.9%	5.8	***	0.8%	2.8%	0.8%	3.3	***
2008	174	-9.1%	-12.0%	1.2%	-10.1	***	-9.1%	-11.0%	1.1%	-9.6	***
2009	305	-7.2%	-8.9%	1.0%	-8.9	***	-1.7%	-3.5%	1.0%	-3.3	***

Table 2B:
Equal-Weighted Percentage Difference in Sales Price and Appraised Value
By Property Type

This table presents statistics for the equally weighted percentage difference in sales price and appraised values two quarters prior to the sale date. Statistics are presented annually by date of appraisal on an adjusted basis, where the adjustment rolls back sales price by the average percentage capital gain from time of the appraisal until the time of sale. For each year, the table shows the mean and a *t*-statistic for testing the null hypothesis that the mean difference is equal to zero, indicating that the appraisal is an unbiased estimate of the sales price. *, **, and *** indicate that the mean is statistically different from zero at the 0.10, 0.05 and 0.01 levels, respectively.

Year	All Types Obs.	Mean	t-Stat	Office Obs.	Mean	t-Stat	Retail Obs.	Mean	t-Stat	Apartment Obs.	Mean	t-Stat	Industrial Obs.	Mean	t-Stat
All	7,214	3.9%	15.7 ***	2,085	4.2%	9.8 ***	1,220	5.3%	6.3 ***	1,436	5.3%	12.5 ***	2,473	2.1%	5.4 ***
1984	44	-6.2%	-4.9 ***	19	-7.3%	-5.4 ***	8	-4.6%	-4.0 ***	1	10.6%		16	-6.8%	-2.4 **
1985	37	0.1%	0.0	8	5.5%	1.2	5	1.5%	1.4	0			24	-2.0%	-1.0
1986	120	0.0%	0.0	30	-3.5%	-1.2	26	0.6%	0.4	3	-5.6%	-2.0 **	61	1.8%	1.2
1987	93	-0.9%	-0.5	24	-2.7%	-0.5	21	2.4%	0.7	1	-4.9%		47	-1.3%	-0.7
1988	125	-5.2%	-3.2 ***	28	-12.6%	-3.6 ***	25	-3.2%	-0.8	8	-5.1%	-1.5 *	64	-2.7%	-1.2
1989	121	-6.1%	-4.2 ***	47	-8.4%	-3.4 ***	12	-3.7%	-1.4	5	-7.3%	-2.3 **	57	-4.6%	-2.1 **
1990	136	-8.3%	-7.7 ***	45	-8.8%	-3.6 ***	14	2.0%	1.3	6	-1.8%	-1.5	71	-10.6%	-8.7 ***
1991	69	-5.4%	-3.5 ***	24	-2.8%	-0.9	6	-3.7%	-1.7 *	4	-1.4%	-0.7	35	-8.0%	-4.1 ***
1992	111	-0.7%	-0.4	36	2.4%	0.7	21	3.5%	1.2	13	-10.5%	-1.6	41	-2.4%	-1.3
1993	149	-1.4%	-1.1	45	1.5%	0.6	20	0.4%	0.2	40	-1.8%	-0.7	44	-4.7%	-2.3 **
1994	197	0.3%	0.2	48	1.4%	0.3	29	-4.9%	-1.1	37	5.2%	3.8 ***	83	-0.7%	-0.4
1995	173	1.1%	0.3	57	1.5%	0.7	30	17.1%	1.1	31	3.2%	1.9 *	55	-9.0%	-1.4
1996	393	3.4%	3.3 ***	109	6.0%	2.8 ***	73	1.2%	0.3	71	2.2%	1.7 *	140	3.1%	2.5 **
1997	403	8.3%	4.7 ***	105	13.1%	5.4 ***	117	5.7%	1.1	65	8.0%	6.8 ***	116	6.7%	5.2 ***
1998	409	5.5%	7.5 ***	106	6.7%	4.7 ***	118	3.9%	2.4 **	69	8.2%	6.1 ***	116	4.4%	3.5 ***
1999	268	2.1%	3.2 ***	91	1.5%	1.4	53	4.0%	2.0 **	48	4.6%	3.9 ***	76	0.0%	0.0
2000	317	1.3%	1.0	104	-0.1%	-0.1	55	-3.9%	-1.9 *	66	4.4%	3.2 ***	92	3.8%	0.9
2001	310	1.7%	2.3 **	72	-0.8%	-0.5	50	0.5%	0.3	109	5.4%	7.2 ***	79	-0.5%	-0.3
2002	383	3.5%	4.7 ***	89	1.9%	1.3	80	9.0%	4.6 ***	81	5.1%	4.2 ***	133	0.2%	0.2
2003	456	4.3%	5.5 ***	129	3.9%	3.5 ***	83	6.8%	2.8 ***	106	2.9%	2.6 ***	138	4.3%	2.6 ***
2004	717	10.0%	14.6 ***	188	6.5%	5.3 ***	170	15.2%	10.3 ***	110	7.5%	4.6 ***	249	10.1%	8.7 ***
2005	697	10.6%	13.7 ***	220	13.0%	8.6 ***	60	10.3%	3.2 ***	163	12.1%	7.5 ***	254	7.5%	7.2 ***
2006	606	11.6%	13.8 ***	205	12.8%	8.1 ***	50	5.8%	2.4 **	148	13.5%	8.2 ***	203	10.3%	7.4 ***
2007	397	2.8%	3.3 ***	134	5.7%	3.8 ***	39	0.0%	0.0	107	3.0%	1.7 *	117	0.2%	0.2
2008	174	-11.0%	-9.6 ***	46	-13.0%	-4.9 ***	13	-7.1%	-1.3	57	-10.1%	-5.5 ***	58	-11.1%	-6.6 ***
2009	305	-3.5%	-3.3 ***	76	-4.6%	-2.1 **	40	4.5%	2.0 **	87	-0.2%	-0.1	102	-8.5%	-4.6 ***

Table 3A:
Value-Weighted Percentage Difference in Sales Price and Appraised Value

This table presents statistics for the value-weighted percentage difference in sales price and appraised values two quarters prior to the sale date. Statistics are presented annually by date of appraisal on both an unadjusted and an adjusted basis, where the adjustment rolls back sales price by the percentage capital gain from time of the appraisal until the time of the next quarter. For each year, the table shows the median, mean, and standard error, as well as a *t*-statistic for testing the null hypothesis that the mean difference is equal to zero, indicating that the appraisal is an unbiased estimate of the sales price. *, **, and *** indicate that the mean is statistically different from zero at the 0.10, 0.05 and 0.01 levels, respectively.

Year	Obs.	Unadjusted for Capital Gains				Adjusted for Capital Gains			
		Median	Mean	S.E.	t-Stat	Median	Mean	S.E.	t-Stat
Total	7,214	4.2%	6.7%	0.2%	30.8 ***	3.2%	5.5%	0.2%	26.3 ***
1984	44	-1.4%	-1.7%	1.0%	-1.8 *	-2.2%	-3.3%	0.9%	-3.5 ***
1985	37	1.7%	3.9%	2.0%	1.9 *	1.4%	3.2%	2.0%	1.6
1986	120	0.3%	0.2%	0.9%	0.2	-0.5%	-0.1%	0.9%	-0.1
1987	93	0.4%	2.4%	1.6%	1.5	0.6%	2.2%	1.6%	1.4
1988	125	0.0%	0.0%	1.4%	0.0	-0.1%	-0.3%	1.4%	-0.2
1989	121	0.0%	-1.7%	1.5%	-1.2	-0.1%	-2.1%	1.5%	-1.4
1990	136	-2.9%	-10.1%	1.8%	-5.7 ***	-2.0%	-9.2%	1.8%	-5.2 ***
1991	69	-6.3%	-9.0%	1.1%	-8.2 ***	-3.8%	-7.4%	1.1%	-6.4 ***
1992	111	-1.9%	-4.3%	1.5%	-3.0 ***	0.3%	-1.9%	1.5%	-1.3
1993	149	0.0%	-2.8%	1.3%	-2.2 **	2.8%	-1.3%	1.3%	-1.0
1994	197	1.2%	-0.2%	1.5%	-0.1	1.8%	-0.1%	1.5%	-0.1
1995	173	0.0%	-0.6%	1.5%	-0.4	-0.2%	-0.9%	1.5%	-0.6
1996	393	1.0%	3.3%	0.7%	4.4 ***	-0.1%	2.4%	0.7%	3.2 ***
1997	403	4.4%	8.4%	0.8%	10.7 ***	3.1%	6.7%	0.8%	8.6 ***
1998	409	4.9%	6.9%	0.6%	11.7 ***	2.9%	4.5%	0.6%	7.7 ***
1999	268	1.1%	2.2%	0.5%	4.0 ***	0.3%	1.4%	0.5%	2.6 **
2000	317	2.8%	3.8%	0.8%	4.6 ***	1.4%	2.5%	0.8%	3.0 ***
2001	310	-0.3%	0.2%	0.6%	0.3	-0.1%	0.3%	0.6%	0.4
2002	383	1.5%	3.7%	0.8%	4.8 ***	2.0%	4.0%	0.8%	5.2 ***
2003	456	6.4%	6.8%	0.7%	9.8 ***	6.0%	6.5%	0.7%	9.3 ***
2004	717	11.0%	11.8%	0.6%	18.9 ***	9.6%	10.0%	0.6%	16.4 ***
2005	697	11.9%	15.7%	0.9%	18.2 ***	7.9%	11.8%	0.8%	13.9 ***
2006	606	15.1%	16.9%	0.8%	21.2 ***	12.6%	13.8%	0.8%	17.7 ***
2007	397	3.9%	7.8%	0.8%	10.0 ***	1.9%	5.6%	0.8%	7.4 ***
2008	174	-12.8%	-16.0%	1.3%	-12.3 ***	-11.9%	-15.2%	1.3%	-12.1 ***
2009	305	-4.2%	-6.6%	0.8%	-7.7 ***	1.6%	-1.2%	0.9%	-1.4

Table 3B:
Value-Weighted Percentage Difference in Sales Price and Appraised Value

This table presents statistics for the value-weighted percentage difference in sales price and appraised values two quarters prior to the sale date. Statistics are presented annually by date of appraisal on an adjusted basis, where the adjustment rolls back sales price by the percentage capital gain from time of the appraisal until the time of sale. For each year and property type, the table shows the mean and a *t*-statistic for testing the null hypothesis that the mean difference is equal to zero, indicating that the appraisal is an unbiased estimate of the sales price.

*, **, and *** indicate that the mean is statistically different from zero at the 0.10, 0.05 and 0.01 levels, respectively.

Year	All Types			Office			Retail			Apartment			Industrial		
	Obs.	Mean	t-Stat.	Obs.	Mean	t-Stat.	Obs.	Mean	t-Stat.	Obs.	Mean	t-Stat.	Obs.	Mean	t-Stat.
All	7,214	5.5%	26.3 ***	2,085	6.3%	14.9 ***	1,220	5.1%	12.0 ***	1,436	5.8%	14.6 ***	2,473	3.5%	8.8 ***
1984	44	-3.3%	-3.5 ***	19	-3.6%	-2.7 ***	8	-2.6%	-2.7 ***	1	10.6%		16	-5.7%	-1.9 *
1985	37	3.2%	1.6	8	12.6%	2.3 **	5	1.6%	1.5	0			24	-1.6%	-0.8
1986	120	-0.1%	-0.1	30	-1.0%	-0.5	26	-0.1%	-0.1	3	-5.1%	-1.8 *	61	2.3%	1.7 *
1987	93	2.2%	1.4	24	-1.2%	-0.4	21	5.2%	1.7 *	1	-4.9%		47	4.2%	1.8 *
1988	125	-0.3%	-0.2	28	-7.2%	-3.2 ***	25	5.8%	1.7 *	8	-5.1%	-1.6 *	64	-1.1%	-0.6
1989	121	-2.1%	-1.4	47	-5.9%	-2.1 **	12	4.3%	2.0 **	5	-7.5%	-2.6 ***	57	-0.6%	-0.3
1990	136	-9.2%	-5.2 ***	45	-14.7%	-3.8 ***	14	1.9%	1.6	6	-2.0%	-2.1 **	71	-7.4%	-5.6 ***
1991	69	-7.4%	-6.4 ***	24	-8.9%	-4.9 ***	6	-2.7%	-1.7 *	4	-1.3%	-0.7	35	-8.2%	-3.6 ***
1992	111	-1.9%	-1.3	36	4.0%	0.9	21	-0.4%	-0.1	13	-6.6%	-1.4	41	-3.2%	-2.2 **
1993	149	-1.3%	-1.0	45	2.0%	0.7	20	3.0%	2.8 ***	40	-2.7%	-1.0	44	-9.1%	-3.8 ***
1994	197	-0.1%	-0.1	48	-3.0%	-0.7	29	-0.8%	-0.2	37	3.8%	3.4 ***	83	0.8%	0.5
1995	173	-0.9%	-0.6	57	0.0%	0.0	30	-1.1%	-0.7	31	4.3%	2.6 ***	55	-7.9%	-1.5
1996	393	2.4%	3.2 ***	109	4.8%	2.7 ***	73	-4.2%	-3.2 ***	71	4.1%	4.1 ***	140	3.6%	3.5 ***
1997	403	6.7%	8.6 ***	105	10.3%	5.4 ***	117	2.8%	2.4 **	65	9.0%	7.2 ***	116	6.3%	5.0 ***
1998	409	4.5%	7.7 ***	106	5.4%	5.1 ***	118	2.6%	2.2 **	69	6.3%	5.1 ***	116	5.4%	4.8 ***
1999	268	1.4%	2.6 ***	91	1.3%	1.6	53	1.3%	1.0	48	5.1%	4.3 ***	76	-1.3%	-1.2
2000	317	2.5%	3.0 ***	104	2.7%	2.3 **	55	-2.0%	-1.4	66	6.0%	4.5 ***	92	2.4%	0.9
2001	310	0.3%	0.4	72	-1.9%	-1.4	50	-1.7%	-1.5	109	5.4%	7.3 ***	79	-2.7%	-1.5
2002	383	4.0%	5.2 ***	89	-2.1%	-1.1	80	9.7%	6.1 ***	81	4.8%	4.1 ***	133	1.1%	1.1
2003	456	6.5%	9.3 ***	129	6.3%	7.0 ***	83	11.5%	6.7 ***	106	4.1%	3.4 ***	138	2.9%	1.5
2004	717	10.0%	16.4 ***	188	8.8%	7.9 ***	170	12.9%	11.5 ***	110	9.8%	6.5 ***	249	9.8%	8.0 ***
2005	697	11.8%	13.9 ***	220	15.5%	10.5 ***	60	9.1%	3.1 ***	163	11.1%	7.4 ***	254	3.1%	1.8 *
2006	606	13.8%	17.7 ***	205	16.5%	11.4 ***	50	8.5%	3.2 ***	148	10.4%	7.6 ***	203	13.4%	11.1 ***
2007	397	5.6%	7.4 ***	134	8.1%	5.7 ***	39	1.7%	0.8	107	3.7%	3.2 ***	117	2.3%	1.8 *
2008	174	-15.2%	-12.1 ***	46	-19.0%	-6.7 ***	13	-9.9%	-3.1 ***	57	-11.6%	-6.3 ***	58	-11.5%	-8.2 ***
2009	305	-1.2%	-1.4	76	-0.6%	-0.3	40	4.9%	2.2 **	87	1.0%	0.7 *	102	-12.4%	-7.8 ***

Table 4A:
Equally Weighted Absolute Percentage Difference in Sales Price and Appraised Value

This table presents statistics for the equally weighted absolute percentage difference in sales price and appraised values two quarters prior to the sale date. Statistics are presented annually by date of appraisal on both an unadjusted and an adjusted basis, where the adjustment rolls back sales price by the percentage capital gain from time of the appraisal until the time of the next quarter. For each year, the table shows the median, mean, and standard error, as well as a *t*-statistic for the null hypothesis that the mean difference is zero, indicating that the appraisal is an unbiased estimate of the sales price. *, **, and *** indicate that the mean is statistically different from zero at the 0.10, 0.05 and 0.01 levels, respectively.

Year	Obs.	Unadjusted for Capital Gains Median	Mean	S.E.	t-Stat	Adjusted for Capital Gains Median	Mean	S.E.	t-Stat
Total	7,214	8.5%	13.2%	0.2%	62.0 ***	8.1%	12.5%	0.2%	61.0 ***
1984	44	6.8%	7.3%	0.9%	7.8 ***	8.7%	8.6%	0.9%	9.9 ***
1985	37	5.2%	6.9%	1.2%	5.8 ***	5.3%	7.0%	1.2%	5.9 ***
1986	120	5.3%	8.1%	0.8%	10.1 ***	5.1%	8.0%	0.8%	10.0 ***
1987	93	8.2%	11.6%	1.4%	8.0 ***	8.6%	11.8%	1.4%	8.2 ***
1988	125	9.5%	12.8%	1.2%	10.6 ***	9.7%	13.0%	1.2%	10.7 ***
1989	121	8.0%	11.7%	1.1%	10.3 ***	8.4%	11.9%	1.1%	10.6 ***
1990	136	8.7%	11.0%	0.9%	11.9 ***	8.3%	10.8%	0.9%	11.9 ***
1991	69	6.4%	9.5%	1.2%	7.7 ***	5.8%	9.0%	1.3%	7.2 ***
1992	111	6.8%	11.4%	1.3%	9.1 ***	7.3%	11.8%	1.3%	9.3 ***
1993	149	5.8%	9.7%	1.0%	9.6 ***	5.8%	10.1%	1.0%	10.0 ***
1994	197	6.0%	11.6%	1.2%	9.5 ***	6.1%	11.6%	1.2%	9.6 ***
1995	173	5.7%	13.5%	3.4%	3.9 ***	5.6%	13.6%	3.5%	3.9 ***
1996	393	6.2%	10.6%	0.9%	11.7 ***	5.8%	10.6%	0.9%	11.8 ***
1997	403	8.0%	14.0%	1.8%	7.9 ***	7.7%	13.4%	1.7%	8.0 ***
1998	409	8.0%	12.0%	0.6%	20.5 ***	6.9%	11.1%	0.6%	20.1 ***
1999	268	5.6%	7.9%	0.5%	15.8 ***	5.3%	7.8%	0.5%	15.9 ***
2000	317	5.7%	9.5%	1.3%	7.5 ***	5.7%	9.5%	1.2%	7.6 ***
2001	310	5.3%	8.4%	0.6%	14.8 ***	5.1%	8.5%	0.6%	15.0 ***
2002	383	7.4%	10.3%	0.5%	19.0 ***	7.3%	10.5%	0.5%	19.1 ***
2003	456	8.2%	11.8%	0.6%	20.0 ***	7.9%	11.7%	0.6%	19.8 ***
2004	717	14.0%	17.2%	0.5%	32.9 ***	12.9%	16.0%	0.5%	32.2 ***
2005	697	14.1%	18.6%	0.7%	27.6 ***	10.7%	16.1%	0.6%	25.8 ***
2006	606	13.1%	18.2%	0.7%	24.8 ***	11.4%	16.5%	0.7%	23.7 ***
2007	397	7.9%	11.9%	0.7%	17.9 ***	7.2%	11.3%	0.6%	17.9 ***
2008	174	11.4%	15.1%	1.0%	15.8 ***	10.0%	14.2%	0.9%	15.4 ***
2009	305	11.9%	14.8%	0.7%	19.8 ***	10.7%	13.4%	0.7%	18.6 ***

Table 4B:
Equally Weighted Absolute Percentage Difference in Sales Price and Appraised Value
By Property Type

This table presents statistics for the equally weighted absolute percentage difference in sales price and appraised values two quarters prior to the sale date. Statistics are presented annually by date of appraisal on an adjusted basis, where the adjustment rolls back sales price by the percentage capital gain from time of the appraisal until the time of the next quarter. For each year and property type, the table shows the mean and a *t*-statistic for the null hypothesis that the mean difference is zero, indicating that the appraisal is an unbiased estimate of the sales price.

*, **, and *** indicate that the mean is statistically different from zero at the 0.10, 0.05 and 0.01 levels, respectively.

Year	All Types Obs.	Mean	t-Stat	Office Obs.	Mean	t-Stat	Retail Obs.	Mean	t-Stat	Apartment Obs.	Mean	t-Stat	Industrial Obs.	Mean	t-Stat
All	7,214	12.5%	61.0 ***	2,085	13.5%	40.6 ***	1,220	13.3%	17.5 ***	1,436	11.0%	33.1 ***	2,473	12.1%	38.5 ***
1984	44	8.6%	9.9 ***	19	7.6%	6.1 ***	8	4.6%	4.0 ***	1	10.6%		16	11.6%	7.8 ***
1985	37	7.0%	5.9 ***	8	9.8%	2.9 ***	5	1.8%	1.9 ***	0			24	7.2%	5.3 ***
1986	120	8.0%	10.0 ***	30	10.5%	4.7 ***	26	5.3%	6.2 ***	3	5.6%	2.0 **	61	8.0%	7.8 ***
1987	93	11.8%	8.2 ***	24	16.5%	3.8 ***	21	10.6%	4.0 ***	1	4.9%		47	10.1%	7.7 ***
1988	125	13.0%	10.7 ***	28	15.0%	4.7 ***	25	11.9%	4.0 ***	8	8.9%	4.9 ***	64	13.1%	8.6 ***
1989	121	11.9%	10.6 ***	47	13.8%	7.3 ***	12	7.8%	4.3 ***	5	7.4%	2.4 **	57	11.5%	6.7 ***
1990	136	10.8%	11.9 ***	45	12.2%	5.9 ***	14	3.2%	2.3 **	6	2.5%	2.8 ***	71	12.1%	12.1 ***
1991	69	9.0%	7.2 ***	24	9.7%	3.7 ***	6	5.0%	3.2 ***	4	3.1%	2.7 ***	35	9.9%	6.0 ***
1992	111	11.8%	9.3 ***	36	16.7%	7.2 ***	21	10.1%	5.0 ***	13	14.5%	2.4 **	41	7.4%	5.1 ***
1993	149	10.1%	10.0 ***	45	12.0%	5.6 ***	20	5.3%	5.2 ***	40	10.9%	5.0 ***	44	9.6%	5.8 ***
1994	197	11.6%	9.6 ***	48	18.2%	5.2 ***	29	12.4%	3.3 ***	37	6.3%	5.2 ***	83	9.9%	7.6 ***
1995	173	13.6%	3.9 ***	57	10.9%	6.8 ***	30	25.0%	1.6 ***	31	7.3%	6.5 ***	55	13.6%	2.1 ***
1996	393	10.6%	11.8 ***	109	11.9%	6.2 ***	73	13.2%	4.0 ***	71	7.3%	7.3 ***	140	9.9%	10.5 ***
1997	403	13.4%	8.0 ***	105	16.8%	7.6 ***	117	15.2%	2.9 ***	65	8.7%	8.0 ***	116	11.1%	11.2 ***
1998	409	11.1%	20.1 ***	106	11.1%	10.0 ***	118	12.5%	10.3 ***	69	10.6%	10.0 ***	116	10.1%	10.8 ***
1999	268	7.8%	15.9 ***	91	7.2%	9.9 ***	53	10.3%	6.8 ***	48	6.7%	7.1 ***	76	7.4%	8.8 ***
2000	317	9.5%	7.6 ***	104	8.9%	10.7 ***	55	9.8%	6.2 ***	66	9.1%	9.7 ***	92	10.3%	2.5 **
2001	310	8.5%	15.0 ***	72	8.9%	8.5 ***	50	8.7%	5.1 ***	109	7.2%	11.9 ***	79	9.9%	6.7 ***
2002	383	10.5%	19.1 ***	89	9.1%	8.0 ***	80	14.0%	9.0 ***	81	8.9%	9.8 ***	133	10.3%	12.4 ***
2003	456	11.7%	19.8 ***	129	10.4%	13.7 ***	83	15.7%	8.5 ***	106	8.8%	11.4 ***	138	12.7%	10.0 ***
2004	717	16.0%	32.2 ***	188	13.5%	15.3 ***	170	19.7%	17.7 ***	110	12.6%	9.6 ***	249	16.8%	21.3 ***
2005	697	16.1%	25.8 ***	220	19.1%	16.1 ***	60	15.5%	5.4 ***	163	15.7%	11.2 ***	254	13.8%	18.4 ***
2006	606	16.5%	23.7 ***	205	18.0%	13.8 ***	50	12.0%	6.4 ***	148	16.8%	11.8 ***	203	15.7%	14.1 ***
2007	397	11.3%	17.9 ***	134	12.8%	11.2 ***	39	7.3%	5.6 ***	107	11.9%	8.4 ***	117	10.2%	10.5 ***
2008	174	14.2%	15.4 ***	46	16.3%	7.5 ***	13	14.5%	3.5 ***	57	13.7%	10.0 ***	58	13.0%	9.1 ***
2009	305	13.4%	18.6 ***	76	15.6%	11.5 ***	40	11.8%	8.7 ***	87	10.7%	8.1 ***	102	14.8%	10.5 ***

Table 5A:
Value-Weighted Absolute Percentage Difference in Sales Price and Appraised Value
This table presents statistics for the equally weighted absolute percentage difference in sales price and appraised values two quarters prior to the sale date. Statistics are presented annually by date of appraisal on both an unadjusted and an adjusted basis, where the adjustment rolls back sales price by the percentage capital gain from time of the appraisal until the time of the next quarter. For each year, the table shows the median, mean, and standard error, as well as a *t*-statistic for the null hypothesis that the mean difference is zero, indicating that the appraisal is an unbiased estimate of the sales price. *, **, and *** indicate that the mean is statistically different from zero at the 0.10, 0.05 and 0.01 levels, respectively.

Year	Obs.	Unadjusted for Capital Gains				Adjusted for Capital Gains			
		Median	Mean	S.E.	t-Stat	Median	Mean	S.E.	t-Stat
Total	7,214	8.6%	13.3%	0.2%	77.3 ***	7.7%	12.4%	0.2%	76.4 ***
1984	44	4.1%	4.5%	0.7%	6.2 ***	3.2%	5.2%	0.7%	7.2 ***
1985	37	4.4%	8.0%	1.6%	4.9 ***	4.4%	7.9%	1.6%	5.0 ***
1986	120	4.7%	7.1%	0.6%	11.2 ***	4.7%	7.1%	0.6%	11.1 ***
1987	93	9.5%	10.5%	1.2%	9.0 ***	10.1%	10.7%	1.2%	9.2 ***
1988	125	7.2%	10.6%	1.0%	10.8 ***	7.0%	10.8%	1.0%	10.9 ***
1989	121	5.3%	9.9%	1.2%	8.5 ***	6.2%	9.9%	1.2%	8.5 ***
1990	136	3.8%	12.4%	1.7%	7.5 ***	4.3%	12.5%	1.6%	7.6 ***
1991	69	6.3%	9.3%	1.1%	8.8 ***	5.6%	8.8%	1.0%	8.9 ***
1992	111	6.0%	10.0%	1.2%	8.5 ***	7.0%	10.3%	1.1%	9.1 ***
1993	149	4.3%	8.6%	1.1%	7.9 ***	4.9%	9.7%	1.1%	9.1 ***
1994	197	4.6%	10.8%	1.3%	8.4 ***	4.9%	10.9%	1.3%	8.6 ***
1995	173	3.8%	7.9%	1.3%	5.9 ***	4.0%	7.9%	1.3%	6.0 ***
1996	393	4.2%	8.1%	0.6%	12.6 ***	4.5%	8.1%	0.6%	13.0 ***
1997	403	6.8%	10.9%	0.7%	15.7 ***	6.5%	10.4%	0.7%	15.7 ***
1998	409	7.0%	9.8%	0.5%	20.4 ***	5.8%	8.8%	0.4%	20.0 ***
1999	268	4.2%	6.4%	0.4%	15.9 ***	3.9%	6.3%	0.4%	16.1 ***
2000	317	5.0%	8.6%	0.7%	12.0 ***	4.7%	8.2%	0.7%	11.7 ***
2001	310	4.2%	6.9%	0.5%	14.3 ***	4.5%	7.1%	0.5%	14.7 ***
2002	383	6.5%	9.9%	0.6%	16.2 ***	6.1%	10.1%	0.6%	16.3 ***
2003	456	8.3%	11.5%	0.5%	21.2 ***	7.9%	11.4%	0.5%	21.0 ***
2004	717	12.8%	15.8%	0.5%	32.9 ***	12.4%	14.6%	0.5%	32.3 ***
2005	697	14.4%	19.9%	0.7%	27.2 ***	11.3%	17.5%	0.7%	25.3 ***
2006	606	16.1%	19.3%	0.7%	27.6 ***	13.8%	17.2%	0.7%	26.1 ***
2007	397	8.9%	12.0%	0.6%	19.3 ***	7.3%	11.2%	0.6%	19.4 ***
2008	174	13.0%	17.8%	1.2%	15.3 ***	12.5%	16.9%	1.1%	15.0 ***
2009	305	10.2%	12.2%	0.6%	19.9 ***	8.8%	11.4%	0.6%	20.6 ***

Table 5B:
Value-Weighted Absolute Percentage Difference in Sales Price and Appraised Value
By Property Type

This table presents statistics for the value-weighted absolute percentage difference in sales price and appraised values two quarters prior to the sale date. Statistics are presented annually by date of appraisal on an adjusted basis, where the adjustment rolls back sales price by the percentage capital gain from time of the appraisal until the time of the sale. For each year, the table shows the mean and a *t*-statistic for the null hypothesis that the mean difference is zero, indicating that the appraisal is an unbiased estimate of the sales price.

*, **, and *** indicate that the mean is statistically different from zero at the 0.10, 0.05 and 0.01 levels, respectively.

	All Types				Office				Retail				Apartment				Industrial			
	Obs.	Mean	t-Stat		Obs.	Mean	t-Stat		Obs.	Mean	t-Stat		Obs.	Mean	t-Stat		Obs.	Mean	t-Stat	
All	7,214	12.4%	76.4	***	2,085	13.9%	43.2	***	1,220	10.4%	30.5	***	1,436	10.9%	35.2	***	2,473	12.7%	41.7	***
1984	44	5.2%	7.2	***	19	5.6%	6.3	***	8	2.6%	2.7	***	1	10.6%			16	10.7%	5.8	***
1985	37	7.9%	5.0	***	8	14.6%	3.1	***	5	1.9%	2.1	**	0				24	5.9%	4.3	***
1986	120	7.1%	11.1	***	30	8.0%	6.5	***	26	5.1%	5.6	***	3	5.1%	1.8	*	61	6.9%	6.1	***
1987	93	10.7%	9.2	***	24	11.5%	5.1	***	21	9.4%	3.7	***	1	4.9%			47	11.3%	6.7	***
1988	125	10.8%	10.9	***	28	9.6%	5.1	***	25	11.4%	4.0	***	8	9.1%	5.7	***	64	11.6%	11.6	***
1989	121	9.9%	8.5	***	47	12.3%	5.3	***	12	6.3%	3.7	***	5	7.5%	2.6	**	57	9.8%	6.2	***
1990	136	12.5%	7.6	***	45	17.8%	5.1	***	14	2.9%	2.9	***	6	2.4%	3.2	***	71	10.1%	9.5	***
1991	69	8.8%	8.9	***	24	10.1%	6.7	***	6	3.8%	3.4	***	4	3.0%	3.1	***	35	10.2%	5.1	***
1992	111	10.3%	9.1	***	36	18.7%	6.2	***	21	11.3%	5.2	***	13	9.1%	2.2	**	41	6.9%	6.3	***
1993	149	9.7%	9.1	***	45	10.6%	4.3	***	20	4.7%	6.5	***	40	10.8%	5.0	***	44	13.0%	6.8	***
1994	197	10.9%	8.6	***	48	14.1%	3.9	***	29	13.5%	3.8	***	37	5.1%	5.3	***	83	9.9%	9.1	***
1995	173	7.9%	6.0	***	57	9.5%	5.7	***	30	5.3%	3.9	***	31	7.9%	6.8	***	55	10.8%	2.0	**
1996	393	8.1%	13.0	***	109	9.5%	5.9	***	73	7.4%	6.7	***	71	6.4%	7.9	***	140	8.1%	9.9	***
1997	403	10.4%	15.7	***	105	12.9%	7.4	***	117	8.4%	9.2	***	65	9.7%	8.2	***	116	10.4%	10.3	***
1998	409	8.8%	20.0	***	106	8.8%	10.9	***	118	8.6%	9.5	***	69	9.1%	9.3	***	116	9.6%	11.1	***
1999	268	6.3%	16.1	***	91	5.5%	8.4	***	53	7.0%	8.2	***	48	7.1%	7.3	***	76	6.8%	9.0	***
2000	317	8.2%	11.7	***	104	8.5%	9.8	***	55	7.3%	7.4	***	66	9.4%	9.5	***	92	6.6%	2.5	**
2001	310	7.1%	14.7	***	72	8.3%	8.1	***	50	4.5%	5.0	***	109	7.1%	12.3	***	79	9.2%	6.0	***
2002	383	10.1%	16.3	***	89	9.8%	5.9	***	80	11.4%	8.1	***	81	8.6%	10.1	***	133	9.3%	13.3	***
2003	456	11.4%	21.0	***	129	9.6%	15.3	***	83	14.5%	10.2	***	106	9.6%	10.9	***	138	13.3%	8.8	***
2004	717	14.6%	32.3	***	188	13.6%	16.6	***	170	15.4%	16.7	***	110	13.5%	11.1	***	249	17.3%	20.6	***
2005	697	17.5%	25.3	***	220	20.2%	16.9	***	60	13.5%	5.1	***	163	14.3%	10.9	***	254	17.5%	13.7	***
2006	606	17.2%	26.1	***	205	20.5%	17.6	***	50	12.0%	5.2	***	148	13.4%	11.6	***	203	15.6%	14.5	***
2007	397	11.2%	19.4	***	134	12.7%	11.1	***	39	11.0%	8.3	***	107	9.0%	10.6	***	117	9.7%	10.7	***
2008	174	16.9%	15.0	***	46	20.2%	7.7	***	13	12.0%	4.7	***	57	14.5%	10.3	***	58	12.2%	9.4	***
2009	305	11.4%	20.6	***	76	11.9%	11.2	***	40	11.8%	8.3	***	87	9.0%	10.5	***	102	15.4%	11.8	***

Table 6A:
Percentage Difference by Type of Appraisal

This table presents statistics for the value-weighted percentage difference in sales price and appraised values two quarters prior to the sale date. Statistics are presented annually by date of appraisal on both an adjusted basis, where the adjustment rolls back sales price by the percentage capital gain from time of the appraisal until the time of sale. *External* and *Internal* indicate that an external or internal appraisal was done two quarters prior to sale date; *No Appraisal* indicates that no new appraisal was indicated for that quarter. For each year, the table shows the median, mean, and standard error, as well as a *t*-statistic for the null hypothesis that the mean difference is zero, indicating that the appraisal is an unbiased estimate of the sales price.

*, **, and *** indicate that the mean is statistically different from zero at the 0.10, 0.05 and 0.01 levels, respectively.

Year	External Obs.	Median	Mean	S.E.	t-Stat.		Internal Obs.	Median	Mean	S.E.	t-Stat.		No Appraisal Obs.	Median	Mean	S.E.	t-Stat.	
All	1,583	1.6%	2.3%	0.4%	5.5	***	1,759	2.1%	3.4%	0.4%	8.8	***	3,872	4.7%	8.1%	0.3%	27.2	***
1984	8	-2.1%	-3.6%	1.0%	-3.6	***							36	-3.2%	-3.1%	1.2%	-2.5	**
1985	3	-2.0%	-11.4%	7.8%	-1.5		5	4.7%	13.7%	8.1%	1.7	*	29	0.2%	1.5%	1.3%	1.2	
1986	18	-2.6%	-1.9%	1.2%	-1.6	*	7	0.6%	1.7%	0.8%	2.2	**	95	-0.2%	0.0%	1.1%	0.0	
1987	11	-11.1%	-6.0%	4.0%	-1.5		4	-5.4%	-3.2%	1.4%	-2.2	**	78	1.1%	4.7%	1.8%	2.6	***
1988	23	5.7%	9.7%	4.8%	2.0	**	7	6.4%	6.7%	3.2%	2.1	**	95	-1.1%	-4.2%	1.3%	-3.2	***
1989	35	2.4%	1.9%	1.6%	1.2		4	-57.8%	-21.1%	22.7%	-0.9		82	-0.3%	-2.1%	1.5%	-1.4	
1990	31	-4.2%	-15.6%	4.7%	-3.3	***	16	0.4%	-3.0%	1.4%	-2.1	**	89	-0.3%	-3.5%	1.4%	-2.6	***
1991	7	-1.5%	-4.3%	3.7%	-1.2		3	-3.8%	-1.9%	2.2%	-0.8		59	-7.5%	-8.1%	1.3%	-6.4	***
1992	27	-0.3%	3.7%	3.5%	1.1		3	1.1%	1.2%	1.3%	0.9		81	0.3%	-3.5%	1.7%	-2.1	**
1993	36	2.8%	-0.1%	2.1%	0.0		10	-39.5%	-28.6%	10.8%	-2.7	***	103	2.8%	0.7%	1.2%	0.6	
1994	39	5.5%	4.9%	1.9%	2.6	***	17	-0.3%	-25.5%	9.9%	-2.6	***	141	1.8%	3.4%	1.0%	3.3	***
1995	17	4.0%	1.7%	2.2%	0.8		36	-0.2%	-2.0%	2.6%	-0.8		120	-0.2%	-0.9%	1.9%	-0.5	
1996	63	1.0%	0.5%	1.2%	0.4		91	-0.9%	-0.8%	0.9%	-0.9		239	0.7%	4.2%	1.1%	3.7	***
1997	46	-0.1%	2.0%	1.2%	1.6	*	102	3.4%	8.5%	1.8%	4.6	***	255	5.2%	7.9%	1.0%	7.9	***
1998	58	2.9%	4.5%	1.2%	3.6	***	121	1.4%	1.9%	1.1%	1.7	*	230	3.8%	5.7%	0.8%	7.2	***
1999	46	0.0%	-0.1%	1.1%	-0.1		91	2.7%	1.9%	0.9%	2.1	**	131	-0.6%	1.7%	0.8%	2.0	**
2000	46	-2.3%	-1.3%	1.1%	-1.1		89	1.3%	3.1%	2.2%	1.4		182	2.3%	3.2%	0.9%	3.6	***
2001	68	0.5%	2.9%	1.1%	2.6	***	84	0.3%	1.4%	0.9%	1.6		158	-0.6%	-1.6%	1.0%	-1.6	*
2002	84	1.4%	-2.0%	2.5%	-0.8		126	2.4%	7.0%	1.3%	5.2	***	173	1.6%	4.2%	0.8%	5.0	***
2003	86	4.8%	5.9%	1.6%	3.6	***	110	6.6%	5.5%	1.6%	3.5	***	260	6.0%	7.0%	0.9%	8.1	***
2004	276	4.3%	7.3%	0.9%	8.5	***	119	9.5%	7.3%	1.5%	4.9	***	322	13.7%	13.0%	1.0%	13.6	***
2005	106	4.2%	7.1%	1.2%	5.9	***	210	3.5%	6.2%	1.2%	5.2	***	381	14.3%	16.2%	1.3%	12.1	***
2006	116	12.6%	16.2%	1.9%	8.7	***	167	5.2%	7.8%	1.0%	8.1	***	323	14.3%	15.3%	1.1%	13.4	***
2007	89	1.4%	3.4%	1.3%	2.6	***	136	1.6%	4.0%	1.2%	3.4	**	172	3.4%	7.7%	1.3%	6.0	***
2008	64	-15.2%	-20.2%	1.7%	-11.7	***	90	-8.2%	-13.1%	2.0%	-6.7	***	20	-5.2%	-7.2%	3.2%	-2.2	**
2009	180	-1.8%	-3.8%	1.1%	-3.4	***	111	2.7%	2.1%	1.3%	1.6	*	14	17.7%	6.3%	4.7%	1.3	

Table 6B:
Absolute Percentage Difference by Type of Appraisal

This table presents statistics for the value-weighted percentage difference in sales price and appraised values two quarters prior to the sale date. Statistics are presented annually by date of appraisal on both an adjusted basis, where the adjustment rolls back sales price by the percentage capital gain from time of the appraisal until the time of the next quarter. *External* and *Internal* indicate that an external or internal appraisal was done two quarters prior to sale date; *No Appraisal* indicates that no new appraisal was done in that quarter. For each year, the table shows the median, mean, and standard error, as well as a *t*-statistic for the null hypothesis that the mean difference is zero.

*, **, and *** indicate that the mean is statistically different from zero at the 0.10, 0.05 and 0.01 levels, respectively.

Year	External					Internal					No Appraisal				
	Obs.	Median	Mean	S.E.	t-Stat	Obs.	Median	Mean	S.E.	t-Stat	Obs.	Median	Mean	S.E.	t-Stat
All	1,583	7.1%	11.7%	0.3%	37.8 ***	1,759	6.8%	10.8%	0.3%	35.8 ***	3,872	8.6%	13.5%	0.2%	56.6 ***
1984	8	2.1%	3.6%	1.0%	3.6 ***	0					36	3.2%	6.0%	0.9%	6.7 ***
1985	3	2.0%	11.4%	7.8%	1.5	5	8.6%	16.1%	7.0%	2.3 **	29	3.6%	4.9%	0.9%	5.4 ***
1986	18	2.6%	4.1%	0.8%	4.9 ***	7	0.6%	1.7%	0.7%	2.3 **	95	7.0%	7.8%	0.7%	10.4 ***
1987	11	11.1%	11.5%	2.5%	4.5 ***	4	5.4%	3.3%	1.3%	2.5 **	78	5.3%	10.9%	1.4%	8.0 ***
1988	23	12.2%	19.2%	3.3%	5.8 ***	7	6.4%	9.1%	2.0%	4.5 ***	95	7.0%	9.2%	1.0%	9.1 ***
1989	35	7.6%	7.9%	0.9%	8.9 ***	4	57.8%	38.5%	13.1%	2.9 ***	82	4.7%	8.3%	1.2%	7.0 ***
1990	31	6.5%	17.8%	4.4%	4.0 ***	16	0.5%	3.6%	1.3%	2.7 ***	89	2.4%	8.2%	1.1%	7.2 ***
1991	7	2.8%	5.8%	3.3%	1.7 *	3	3.8%	3.5%	0.8%	4.1 ***	59	7.5%	9.5%	1.1%	8.7 ***
1992	27	5.1%	9.0%	3.1%	2.9 ***	3	1.1%	1.6%	1.1%	1.5	81	8.2%	11.3%	1.2%	9.3 ***
1993	36	5.7%	8.3%	1.6%	5.4 ***	10	39.5%	32.5%	9.5%	3.4 ***	103	4.0%	8.1%	0.9%	8.7 ***
1994	39	5.6%	8.6%	1.5%	5.6 ***	17	7.4%	30.0%	9.1%	3.3 ***	141	4.3%	7.9%	0.9%	9.2 ***
1995	17	5.4%	7.4%	1.2%	6.0 ***	36	2.4%	7.2%	2.3%	3.2 ***	120	4.0%	8.2%	1.8%	4.7 ***
1996	63	4.7%	7.0%	0.9%	8.2 ***	91	6.1%	6.6%	0.6%	11.9 ***	239	3.6%	9.0%	1.0%	9.1 ***
1997	46	3.1%	5.1%	1.0%	5.4 ***	102	8.9%	13.0%	1.5%	8.4 ***	255	6.9%	11.4%	0.9%	13.3 ***
1998	58	5.4%	7.1%	1.0%	7.1 ***	121	5.0%	8.2%	0.8%	10.4 ***	230	5.9%	9.5%	0.6%	15.5 ***
1999	46	4.0%	6.1%	0.7%	8.7 ***	91	4.3%	6.7%	0.6%	10.6 ***	131	2.8%	6.1%	0.6%	9.7 ***
2000	46	4.1%	4.9%	0.9%	5.6 ***	89	5.0%	8.9%	2.0%	4.4 ***	182	5.4%	8.7%	0.7%	13.3 ***
2001	68	4.2%	6.6%	0.8%	8.0 ***	84	4.6%	6.1%	0.6%	10.0 ***	158	4.6%	7.9%	0.8%	9.6 ***
2002	84	7.1%	13.2%	2.1%	6.3 ***	126	6.9%	11.0%	1.1%	10.1 ***	173	6.0%	8.5%	0.6%	13.5 ***
2003	86	8.4%	11.9%	1.2%	10.1 ***	110	6.8%	11.0%	1.3%	8.5 ***	260	8.2%	11.4%	0.7%	17.0 ***
2004	276	9.4%	12.0%	0.6%	18.5 ***	119	12.4%	13.9%	1.0%	14.1 ***	322	15.4%	17.1%	0.7%	23.3 ***
2005	106	7.0%	10.7%	0.9%	11.5 ***	210	7.4%	12.3%	0.9%	13.0 ***	381	17.7%	22.6%	1.1%	21.1 ***
2006	116	13.8%	19.0%	1.6%	11.7 ***	167	7.8%	10.6%	0.8%	13.2 ***	323	15.5%	19.2%	0.9%	20.3 ***
2007	89	5.9%	9.1%	1.0%	9.5 ***	136	7.3%	10.1%	0.8%	12.2 ***	172	8.0%	13.0%	1.0%	12.8 ***
2008	64	15.2%	20.6%	1.6%	12.5 ***	90	8.4%	15.8%	1.7%	9.1 ***	20	5.2%	9.8%	2.8%	3.5 ***
2009	180	8.4%	11.6%	0.7%	15.6 ***	111	6.1%	10.2%	0.9%	11.5 ***	14	19.2%	16.6%	2.1%	7.9 ***

Table 7:
Determinants of the Average Percentage Difference in Sales Price and Appraised Value

This table presents the results from an ordinary-least-squares regression where the dependent variable is the quarterly average percentage difference (Panel A) or average absolute percentage difference (Panel B) in sales price and the two-quarter prior appraised value (equal-weighted and adjusted for capital gains) and the explanatory variables are as indicated in the table. *NPI Appreciation* and *Chg. NPI Income* return refer to the quarterly appreciation return and four-quarter percentage change in the quarterly income return of the NCREIF National Property Index, respectively. *NPI Number of Sales* is the quarterly number of properties sold out of the NPI portfolio. *Chg. RERC Cap Rate* is a proxy for the four-quarter change in the quarterly RERC Internal Rate of Return. *Chg. Constr. Cost* is the percentage change in the U.S. Census Index of Construction Costs. In Panel B, *ABS* indicates an absolute value. For each variable, the table presents the coefficient over its associated *t*-statistic. The sample period covers 106 quarters beginning with Q1 1984 and ending with Q4 2009. *, **, and *** indicate that the coefficient is statistically different from zero at the 0.10, 0.05 and 0.01 levels, respectively.

Panel A: Average Equal-Weighted Quarterly Percentage Difference in Sales Price and Appraised Value

Variable	Parms	Parms	Parms	Parms	Parms	Parms
Intercept	0.0075	-0.042 ***	0.0071	-0.0012	-0.013	0.0299 ***
	1.25	-5.26	1.13	-0.21	-1.53	-3.15
NPI Appreciation	0.78 ***					-0.424
	2.93					-1.30
NPI Number of Sales		0.00072 ***				0.00061 ***
		7.9				6.89
Chg. NPI Income			-0.046			0.328 ***
			-0.55			4.21
Chg. RERC Cap Rate				-0.079 ***		-0.14 ***
				-5.08		-4.62
Chg. Constr. Cost					0.657 ***	-0.568 **
					3.33	-2.23
F-Statistic	8.59 ***	62.36 ***	0.3	25.84 ***	11.11 ***	22.37 ***
Adj. R2	0.068	0.371	-0.007	0.193	0.089	0.507
Obs.	106	106	106	106	106	106

Panel B: Average Equal-Weighted Absolute Percentage Difference in Sales Price and Appraised Value

Variable	Parms	Parms	Parms	Parms	Parms	Parms
Intercept	0.1061 ***	0.0983 ***	0.1037 ***	0.1001 ***	0.0945 ***	0.0822 ***
	24.35	19.18	21.40	21.62	13.95	11.02
ABS NPI Appreciation	0.485 **					0.197
	2.52					0.84
NPI Number of Sales		0.00022				0.00014 **
		3.75				2.29
ABS Chg. NPI Income			0.174 ***			0.102
			2.70			1.53
ABS Chg. RERC Cap Rate				0.048		0.012
				0.012		0.65
ABS Chg. Constr. Cost					0.494 ***	0.246
					3.17	1.4
F-Statistic	6.34 **	14.09 ***	7.31 ***	15.36 ***	10.06 ***	5.52 ***
Adj. R2	0.049	0.111	0.057	0.121	0.080	0.179
Obs.	106	106	106	106	106	106

Table 8:
Determinants of the Percentage Difference in Sales Price and Appraised Value

This table presents the results from an ordinary-least-squares regression where the dependent variable is the quarterly signed percentage difference (Panel A) or absolute percentage difference (Panel B) in sales price and the two-quarter prior appraised value (equal-weighted and adjusted for capital gains) and the explanatory variables are as indicated in the table. *NPI Appreciation* and *Chg. NPI Income* return refer to the quarterly appreciation return and four-quarter percentage change in the quarterly income return of the NCREIF National Property Index, respectively. *Chg. RERC Cap Rate* is a proxy for the four-quarter change in the quarterly RERC Internal Rate of Return. *Chg. Constr. Cost* is the percentage change in the U.S. Census Index of Construction Costs.

Open-End is an indicator variable for Open-End Commingled Real Estate Fund properties, *ODCE Open-End* is an indicator variable for ODCE Open-End Fund properties, and *Closed-End* is an indicator for Closed-End Commingled Real Estate Fund properties, with the omitted category being *Separate Account* Properties. *External* is an indicator variable for external appraisals, *Internal* is an indicator for internal appraisals, with the omitted category being no appraisal indicated. *Levered* is an indicator variable for levered properties, with unlevered properties being the omitted category. *Office*, *Retail* and *Apartment* are indicators for those property types with *Industrial* being the omitted category. In Panel B, *ABS* indicates an absolute value. For each variable, the table presents the coefficient next to its associated *t*-statistic. The sample period covers 106 quarters beginning with Q1 1984 and ending with Q4 2009.

*, **, and *** indicate that the coefficient is statistically different from zero at the 0.10, 0.05 and 0.01 levels, respectively.

Panel A: Signed Percentage Difference				Panel B: Absolute Percentage Difference		
Variable	**Coef.**	**t-Stat**		**Variable**	**Coef.**	**t-Stat**
Intercept	-0.029	-5.38 ***		**Intercept**	0.078	18.48 ***
NPI Appreciation	-0.180	-1.14		**ABS NPI Appreciation**	0.407	3.33 ***
Chg. NPI Income	0.264	6.71 ***		**ABS Chg. NPI Income**	0.101	2.88 ***
NPI Number of Sales	0.00047	12.2 ***		**NPI Number of Sales**	0.00012	4.28 ***
Chg. RERC Cap Rate	-0.100	-6.73 ***		**ABS Chg. RERC Cap Rate**	0.014	1.46
Chg. Constr. Cost	-0.362	-3.00 ***		**ABS Chg. Constr. Cost**	0.286	3.27 ***
Open-End	-0.014	-2.22 **		**Open-End**	-0.004	-0.9
ODCE Open-End	-0.026	-2.43 **		**ODCE Open-End**	0.001	0.12
Closed-End	-0.003	-0.41		**Closed-End**	0.000	0.04
External	-0.016	-3.08 ***		**External**	-0.022	-5.69 ***
Internal	-0.016	-3.35 ***		**Internal**	-0.020	-5.39 ***
Levered	0.021	4.99 ***		**Levered**	0.010	2.97 ***
Office	0.020	4.06 ***		**Office**	0.015	3.98 ***
Retail	0.010	1.78 *		**Retail**	0.004	0.97
Apartment	0.030	5.52 ***		**Apartment**	-0.009	-2.13 **
F-Statistic	42.00	***		**F-Statistic**	21.54	***
Adjusted R-Square	0.074			**Adjusted R-Square**	0.038	
Observations	1,799			**Observations**	1,799	