6-10-2012

# List Price Information in the Negotiation of Commercial Real Estate Transactions: Is Silence Golden?

Dean Gatzlaff
*Florida State University*

Peng Liu Ph.D.
*Cornell Universtiy*, pl333@cornell.edu

# List Price Information in the Negotiation of Commercial Real Estate Transactions: Is Silence Golden?


## Abstract

This study examines the use (and non-use) of list price information in the process of marketing commercial real estate. As far as we are aware, this has not been addressed in the literature. While housing market research suggests that list prices can serve as a strong anchor and/or signal, list price information is included in less than one-third of the commercial property sales and is less likely to be included as part of the sellers' offering information for larger multi-tenant properties. Given the potentially powerful effect of list prices (first offers) on outcomes, the non-use of list price information is a puzzle. We speculate that the limited use of list prices may be due to the sellers' interests in both maintaining their informational advantage and not truncating higher than expected offers, especially during periods of economic growth or with more complex properties. Using a two-stage selection correction model, we find that office properties which provide list price information are, on average, associated with lower price outcomes (ceteris paribus) and that these outcomes vary by price cohort and economic condition. It is important to note, however, that while these findings identify a correlation, they do not necessarily imply causation (i.e., that the use of list prices 'cause' transaction prices to be lower). Our results support the notion that asymmetric information and signaling (i.e., the conveyance of property and/or seller information that may affect the likelihood of sale) play a dominant role in explaining the sellers' strategic non-use of list price information in the commercial property market.



## Keywords

Cornell, commercial real estate sales, negotiation, listing price, anchoring, signaling

## Disciplines

Real Estate

## Comments

Required Publisher Statement

The Center for Real Estate and Finance
Leaders in commercial real estate education, research, and knowledge

# WORKING PAPER SERIES-2012

## WORKING PAPER 2012-004

# List Price Information in the Negotiation of Commercial Real Estate Transactions: Is Silence Golden?

Dean Gatzlaff and Peng (Peter) Liu

June 10, 2012



Cornell University
School of Hotel Administration

# List Price Information in the Negotiation of Commercial Real Estate Transactions: Is Silence Golden?

by
Dean Gatzlaff * and Peng (Peter) Liu**

June 10, 2012

*This study examines the use (and non-use) of list price information in the process of marketing commercial real estate. As far as we are aware, this has not been addressed in the literature. While housing market research suggests that list prices can serve as a strong anchor and/or signal, list price information is included in less than one-third of the commercial property sales and is less likely to be included as part of the sellers' offering information for larger multi-tenant properties. Given the potentially powerful effect of list prices (first offers) on outcomes, the non-use of list price information is a puzzle. We speculate that the limited use of list prices may be due to the sellers' interests in both maintaining their informational advantage and not truncating higher than expected offers, especially during periods of economic growth or with more complex properties. Using a two-stage selection correction model, we find that office properties which provide list price information are, on average, associated with lower price outcomes (ceteris paribus) and that these outcomes vary by price cohort and economic condition. It is important to note, however, that while these findings identify a correlation, they do not necessarily imply causation (i.e., that the use of list prices 'cause' transaction prices to be lower). Our results support the notion that asymmetric information and signaling (i.e., the conveyance of property and/or seller information that may affect the likelihood of sale) play a dominant role in explaining the sellers' strategic non-use of list price information in the commercial property market.*

*Acknowledgement: The authors thank discussants Tobias Muhlhofer and Abdullah Yavas for their comments, as well as participants at the FSU-UF Critical Issues in Real Estate Symposium hosted at the University of Florida; the AREUEA meetings in Washington, D.C.; and the ARES meetings in St. Pete Beach, FL where earlier versions of this paper were presented.*

Keywords: commercial real estate sales, negotiation, listing price, anchoring, signaling.

* The Florida State University, Center for Real Estate, College of Business, Tallahassee, FL 32306-1110; 850.644.4071; DGATZLAFF@FSU.EDU

** Cornell University, Center for Real Estate and Finance, School of Hotel Administration, Ithaca, NY 14853; 607.254.2960; PENG.LIU@CORNELL.EDU

# List Price Information in the Negotiation of Commercial Real Estate Transactions: Is Silence Golden?

## 1. INTRODUCTION

While the process of negotiating real property transactions has received some attention in the literature, it remains poorly understood. It is clear that property-, market-, and transaction-specific information are critical to the process of establishing buyer offer prices. However, it is also well known that cognitive reasoning and human behavior can, and do, influence the processing of this information and decision making outcomes.

Past studies have examined the influence that revealed asking prices of sellers (the sellers' list prices) may have on the negotiation process and transaction prices. This line of research has focused on the housing market. Less understood, however, is the use (or non-use) of list price information in the sale of commercial real estate, such as office buildings, retail centers, storage facilities and apartment complexes. Unlike in the housing market, income-producing commercial properties are often offered for sale without specifying the seller's asking price.

The housing market research literature indicates that list prices can play a strategic role in the transaction process.[1] Consistent with the anchoring heuristic, stating a high list price relative to market value has been found to be positively associated with a higher value perception and a higher transaction price. In contrast, unusually high (or low) list prices may serve as a signal that conveys information to potential buyers about the sellers' motivations and/or atypical property features.

Given the possible strategic influence of anchoring and signaling, why sellers of commercial properties do not always use list price information to "anchor" a property's value and/or convey information is a puzzle. This paper contributes to the literature by (1) examining the underlying determinants of the likelihood of revealing list prices when marketing commercial property and (2) evaluating the relationship between the use of list price information and transaction prices. We are not aware of any previous works that have looked at these issues within the context of the commercial property market.

[1] See, for example, Bucchianeri and Minson (2011); Knight (2002); Yavas and Yang (1995); Knight, Sirmans and Turnbull (1994); Horowitz (1992); and Geltner, Kluger and Miller (1991).

We report that larger more complex multi-tenant properties are less likely to reveal list price information; that after controlling for property- and market-specific factors the prices of properties sold that used list prices are, on average, *lower* than those sold without list prices; and that the price differences vary by price cohort and economic condition. Our findings do not imply that list prices cause transaction prices to be lower, but that their use is correlated with lower prices. The results support the notion that sellers do not reveal list price information in order to maintain an information advantage and not truncate higher than expected offers, especially during periods of growth or when marketing complex properties. In this environment, revealed list prices may be effectively used to signal additional information (e.g., seller motivations) to the market. Thus, asymmetric information and signaling are argued to play a dominant role in explaining the sellers' strategic non-use of list price information in the commercial property market.

The paper is organized as follows. Section 2 provides context and motivation for the study. The empirical methodology adopted is discussed in Section 3. The data are described in Section 4 and the test results reported in Section 5, followed by the conclusion.

## 2. MOTIVATION AND LITERATURE

Much like in the residential market, the marketing and sale of commercial property is often facilitated by listing brokers and agents. The commercial property broker assembles information deemed relevant to potential buyer interests in forming and submitting offers for purchase. The materials assembled (e.g., an offering memorandum) typically include information on the market, the site and its location, the structure and other improvements, the tenants and their leases, comparable properties, and income and expense (pro forma) data. This information may be distributed directly to potential buyers and their advisors, or to potential buyers through the agents' network and their listing channels.

Compared to the housing market, commercial real estate tends to be marketed more directly to buyers and their advisors through the brokers' network. This effort may include placing the information on an online service

such as LoopNet,[2] the Commercial Investment Multiple Listings Service (CIMLS), COMMREX Commercial Real Estate Exchange, and/or on a private password-protected website. Sometimes, especially for Class A properties, offering memoranda are sent directly to potential buyers, advisors, and agents indicating the bid due dates. As specified in the memoranda, the offers received may be accepted, negotiated, re-bid, or rejected.[3] In all cases, the information provided may or may not specify a seller's asking price.[4] Instead, some information regarding the seller's asking price may be privately conveyed during the process by what is commonly known as a "whisper" price (e.g., "we think the property should sell between x and y" or "we believe the property should sell at a cap rate of about 6"). Thus, seller list prices are most often not openly revealed when transacting commercial property.

This is puzzling, because the housing literature indicates that list prices may be strategically used to market the property. In looking at the housing market, Bucchianeri and Minson (2011) report that "the commonly recommended practice of underpricing in fact relates to less favorable outcomes…[and that] relatively high listing prices lead to higher sale prices..." Specifically, list prices may serve as a price anchor and influence buyer perceptions of value.

Northcraft and Neale (1987) indicate that when asked to value a single-family home, real estate agents were influenced by its list price. Agents were given an information packet and each asked to value the same home. All agents received identical information packets, except for the asking price of the subject property. Although most claimed the asking price was not relevant information, the agents' subsequent estimates of value were found to be positively correlated with the asking price. Consistent with the anchoring effect of the list prices, Black and Diaz (1996) report that in a controlled lab experiment both the buyers' opening offers and the eventual outcomes were positively correlated with manipulated list prices. They report that even when the manipulated list price is incongruous, negotiators may anchor on list price and devalue complex property- and market-specific information. Furthermore, list prices may be viewed as first offers which have been shown to have powerful effects on outcomes (e.g., Van Poucke and Beulens (2002), Galinsky and Mussweiler (2001)).

[2] It was announced in April of 2011 that CoStar Group, Inc. was acquiring LoopNet, Inc. and that the transaction was expected to be completed by the end of 2011 or early 2012.

[3] For example, the memorandum may indicate that "all interested parties must submit a non-binding Letter of Intent, by" a specified date. Generally, summarized information sheets known as "teaser" sheets are distributed to potential buyers through the brokers' network prior to sending formal offering memoranda with required bid dates.

[4] The offering may specify a list price, it may specify that the owner has not established a listing price, or it may omit any mention of list price information. Additional information, direct and indirect, may be provided in the listing that indicates possible seller motivations.

Alternatively, sellers may use list prices to convey private information, or as strategic signals, to specific buyers (e.g., Yavas and Yang, 1995). For example, the list price may be set unusually low to signal a distressed sale, or unusually high to signal the seller's willingness to wait for a certain type buyer. In this case, perceived underpricing and over-pricing outcomes may be viewed as rational. Thus, list prices may be used by sellers strategically as anchors or as signals, or as both. So why are list prices not consistently used in marketing commercial property?

One possible explanation is that commercial real estate investors, especially institutional investors, are sophisticated and experienced enough not to be significantly influenced by the list price. Investor offer prices are based primarily on the income generating characteristics of the property and their own investment requirements. Viewed from this perspective, list prices are irrelevant and would have little if any anchoring effect on the sale prices of commercial properties. It is interesting to note that Bokhari and Geltner (2011) in a study focused on risk aversion, report a large anchoring or signaling effect (they cannot distinguish the type) associated with the overpricing of commercial property. Moreover, they find that this effect is larger for more experienced or sophisticated investors. To the degree that this outcome can be attributed to anchoring, and not signaling, it challenges the notion that experts are less influenced by the anchoring heuristic.

A second possible explanation is that uncertain and asymmetric information may affect the propensity of making the first offer in a negotiation process (Oesch and Galinsky (2011)). In a commercial property sale, the seller typically holds more information than the buyer. Because of this, buyer offers have a wide range of possible values. By not disclosing a list price, the seller does not truncate the distribution of possible offers and is able to take advantage of those that might be higher than expected. If buyers happen to be aggressive they may exceed sellers' expectations and money is not "left on the table," consistent with the notion of "not tipping your hand." In this case, we would expect to see the use of list prices correlated with information certainty and the distribution of possible offers.

Third, the use (and non-use) of list prices may serve as a signal to potential buyers. List prices, when used, may convey (i.e., signal) information about the quality or type of the property to specific buyers, or about the willingness of the seller to negotiate. For example, a particularly low list price on a property may imply that the seller

is highly motivated and willing to negotiate, or that atypical property features exist (e.g., deferred maintenance, unusually low occupancy rates, or a number of other factors).

Or, finally, some combination of these explanations is possible. For example, the use of a "whisper price" may be viewed as a combination approach. It allows the seller to gage buyer response and solicit potential offer information, with the option of providing an anchor. Interestingly, Valley, White, Neale, and Bazerman (1992), studying the impact of information shared with third-party real estate agents, discovered that the house sale prices were higher when buyer reservation prices were shared with agents and lowest when agents knew only seller reservation prices.

## 3. METHODOLOGY

To evaluate the use and effect of list prices in commercial property transactions, we first examine the determinants of the likelihood of the seller using a list price when marketing the property, and then examine the effect of the list price on the sale price.

### *3.1 The Likelihood of using a List Price*

The likelihood of a list price being used when marketing the property is assumed to be a function of the property, the market, and the conditions of the type of sale (i.e., seller, buyer, and sale conditions). The probability of using a list price when it is offered for sale can be estimated as a probit model, and specified

$$\Pr\left(LIST_j = 1 \mid Z_j\right) = \Phi\left(\beta_j Z_j\right) + e_j\,, \tag{1}$$

where $LIST_{jt} = 1$ if property $j$ uses a listing price, 0 otherwise and $Z$ is a vector of market, property, and sale condition variables that are used to "explain" the likelihood of the property sale. $\Phi$ is the standard cumulative normal distribution, $\beta$ the estimated coefficient, and $e_j$ the estimation error. $(\beta_j Z_j)$ results in producing a probit score, or index, that is used to evaluate the marginal effect and statistical significance of each variable on the likelihood of listing the property.

Our hypothesis is that larger, more complex, property transactions are less likely to use listing prices in the transaction process. In complex transactions, the potential distribution of buyer offers may be unusually wide,

especially during times of strong economic growth. Because sellers retain the right to reject all offers, they may be less inclined to publicly list price information (and reservation price information) in a way that could truncate possible offers. In less complex smaller property transactions, where the potential distribution of offers is narrower, sellers are more likely to publish list price information in an effort to strategically "anchor" the potential offers, or to signal to prospective buyers their willingness to negotiate and (in the case of a unusually low listing price) sell at a "bargain."

### *3.2 The Relationship Between using a List Price and the Transaction Price*

Second, we examine the effect of list price, if any, on sale price. To examine this, we initially estimate a standard hedonic regression, specified as

$$\ln SP_{it} = a_0 + \Sigma_{j=1}^{k}\beta_j X_{jit} + c\ LIST_{it} + \Sigma_{t=1}^{T}\delta_t D_{it} + e_{it}, \quad (2)$$

where $SP_{it}$ is the transaction price of property i at time t,; $\beta_j$ are a vector of coefficients on the property, condition of sale, and market characteristics, $X_{jit}$; $c$ is the coefficient on the dummy $LIST_{it}$ with values 1 if a list price is used in period $t$ and 0 otherwise; $\delta_t$ the time coefficients of $D_{it}$, time dummies with values of 1 if the ith property sold in period $t$ and 0 otherwise; and $e_{it}$ is the random error with mean, 0, and variance σ. Estimates of the coefficient, $c$, yield an estimate of the marginal relationship of the listing on the sale of the property evaluated at the mean.

If list prices, when used, primarily serve as a "signal" to commercial property buyers of the sellers' willingness to negotiate the property sale, the estimated coefficient on *LIST* is expected to be negative. Alternatively, if commercial property list prices primarily (and effectively) serve as a strategic pricing "anchor," we would expect the estimated coefficient, $c$, to be positive. Of course, it is possible (and likely) that use of list price information is a combination of the two tactics. The influence of list price information on transaction outcomes will depend on which effect dominates.

### *3.3 A Selection-Corrected Model – The Decision to List and the Transaction Price*

Because a property's transaction price, $SP_{it}$, is likely to be affected by many of the same factors influencing the likelihood of using a list price in marketing the property, we estimate a two-stage model and examine alternate

interactive specifications. We are interested in the estimated coefficient, $c$, on *LIST*; however, estimates of the OLS regression (2) may be subject to selection bias.

In the standard selection bias problem, information on the dependent variable for part of the sample is missing (or cannot be determined). In a second type of selection bias problem, dependent variable information is not missing, but its distribution is selective. In our case, the decision of sellers to use list price information may be selective. If we estimate an OLS regression with $SP_{it}$ as dependent variable and a dummy indicating whether or not a list price is used as one of the independent variables, we may get a biased estimate on the effect of listing because the distribution of transaction prices over the categories of "listed" properties and "nonlisted" properties was not random. Properties using revealed list price information may simply be different from those that do not. If these characteristics are related to price, the coefficient of the *LIST* dummy may capture these effects and be biased.

To correct for this potential bias we adopt the Heckman selection correction procedure. The first step of the procedure is to estimate the probit regression (1) and then to include the inverse Mills ratio (*IMR*) created from the probit results as an independent variable in the second stage hedonic price equation (2), such that:

$$\ln SP_{it} = a_0 + \Sigma_{j=1}^{k}\beta_j X_{jit} + c\ LIST_{it} + \Sigma_{t=1}^{T}\delta_t D_{it} + \gamma IMR_{it} + e_{it}. \quad (3)$$

Heckman (1979) shows that that the inclusion of IMR corrects for the bias of the coefficient estimates. We note that the standard errors of the coefficient are also biased and additional corrections required.

## 4. DATA

The data used in this study come from the CoStar group, a Washington D.C. based public company that maintains one of the largest and most comprehensive databases of commercial real estate information in the U.S. A complete set of property- and transaction-specific variables for each of the characteristics of interest, including the seller's list price if used, is available for the January 2006 to December 2011 period. This six-year period spans a range of market conditions, including a period of especially strong growth followed by a rapid decline and then a slight increase in U.S. commercial real estate market transaction activity. This allows us to examine the hypotheses under varying economic conditions.

Sale observations were limited to office properties greater than 2,000 sf; sold for $100,000 to $500 million; and less than 100 years of age at their time of sale. While observations with atypical sale or non-arm's length conditions were excluded (e.g., portfolio and multi-property sales, land sales, build-to-suit, sales associated with development or expansions), special effort was taken to include a wide range of transaction types. For example, a small but nontrivial portion of the observations (< 5%) coded as special condition sales (e.g., 1031 tax-deferred exchanges, tenant purchases, distressed sales, sale leasebacks, or property shell sales) are included.

The final data set includes 25,862 office building transactions located in 24 U.S. real estate markets: Atlanta, Boston, Chicago, Dallas–Ft. Worth, Detroit, Denver, East Bay–Oakland, Inland Empire (California), Las Vegas, Los Angeles, New York, Orange (California), Orlando, Philadelphia, Phoenix, Portland, Sacramento, San Diego, San Francisco, Seattle–Puget Sound, South Florida, South Bay–San Jose, Tampa–St. Petersburg, and Washington D.C.

Summary statistics of the data are reported in Table 1 and each of the variables is defined in Table 2. Transaction prices range widely from a low of $100,000 to a high of $498 million, with a mean price of $6.2 million and a median price of $1.2 million, characteristic of a skewed price distribution. The average office observation is 30,510 square feet in size and 27.4 years old. The mean (median) sale price per square foot is $188.64 ($160.81). Assessed values of the properties average $3.63 million, or 58.6% percent of the mean transaction price. Similarly, the median assessed value is 58.3% of the median sale price. Of particular interest, 31.5% (8,147) of the sale observations report the use of a formal list price when marketing the property.

[INSERT TABLES 1 AND 2 AROUND HERE]

The observations vary considerably by class, tenant structure, and condition. For example, 6.3% of the sale observations are classified as Class A (core, institutional-quality) properties; 64.7% are multi-tenant properties; and 0.7% are coded as "poor" quality properties. Sales vary by year in a pattern consistent with that casually observed during this period. In other words, strong transaction activity in 2006 and 2007 is followed by a precipitous decline in sale observations from 2008 through 2010, and then a slight increase in 2011. Observations sold in years 2006 through 2011 represent 22.1%, 23.9%, 17.8%, 12.2%, 11.0% and 13.0% of the data, respectively. Also, noted is the variation in observations by location, with approximately one third (32.6%) of the observations occurring within the

five "gateway" cities of New York (11.9%), Los Angeles (7.0%), Chicago (6.1%), Boston (4.0%) and Washington, D.C. (3.6%) and about two thirds (67.4%) occurring within the remaining 19 metropolitan markets.

As shown in Table 3, the percentage of properties that use a stated list price varies from a high of 39% for properties $100,000 to $1 million, to a low of 3% for properties in the $50 million to 100 million. In general, higher priced properties were much less likely to state a formal listing price when offered for sale.

[INSERT TABLE 3 AROUND HERE]

## 5. EMPIRICAL RESULTS

### *5.1 Probit Model Estimates*

The estimates of the probit model (Equation 1), which examines the likelihood that the seller will use a stated list price when marketing the property, are reported in Table 4. Four general factors are examined: the characteristics of the structure; conditions specific to the sale; the economic conditions; and conditions within the local market. To evaluate the sensitivity of the estimated coefficients, four alternative specifications are estimated. Model 4.1 in Table 4 includes only the structural characteristics of the property (i.e., *SQFT*, *AGE*, *PSF*, *CL-A*, *MULT*, and *COND*) in the specification. *SQFT* and *AGE* control for differences in property size (square feet) and age (years), while *PSF* (sale price per square foot specified as a categorical variable),[5] *CL-A* (Class A property) and *COND* (poor quality of building condition) control for variations in property quality. Each of the estimated coefficients has the sign expected and is statistically significant at the 1% level, with the exception of *MULT* and *COND* which are significant at the 5% and 10% levels, respectively. The results indicate that, on average, listing price information is less likely to be used on larger, newer, higher-quality, multi-tenant properties. Or, smaller, older, single-tenant properties are more likely to use list price information when marketed. This is consistent with the idea that the sellers of larger, more complex, income-producing office properties (with complex lease structures and varying cash flow expectations) do not reveal list price information to maintain an information advantage and not constrain potential buyer offers.

[5] PSF, price per square foot is specified as a categorical variable with values ranging from 1 to 12 (low to high) and with equal observations in each category. This specification allows *PSF* to be included later in the first stage of the two-stage selection correction model, when evaluating the relationship between *LIST* and sale price, *lnSP*.

[INSERT TABLE 4 AROUND HERE]

The estimates reported for the Model 4.2 specification add several factors that are specific to the conditions of sale. Five types of sale conditions are included: a 1031 tax-deferred exchange (*EXC*); a tenant purchase of the property (*TEN*); a sale-leaseback transaction (*S-LB*); the sale of a building shell (*SHL*); and the sale of a property coded as a distressed sale (*DIS*).[6] The use of a stated list price is found to be more likely when selling *EXC*, *SHL*, and *DIS* properties and less likely when a tenant is involved in the purchase of the property.

Model specifications 4.3 and 4.4 in Table 4 further include year and location dummies (fixed effects). The likelihood of using list price information is found to vary by year and by market. Observations sold in *YR11* are excluded and the estimates evaluated relative to that year. Interestingly, list prices were much less likely to be used during the strong economic period of 2006 and, *ceteris paribus*, a period of potentially large offer price variation. Market conditions also appear to affect the use of list price information, perhaps due to local economic conditions or local market norms. Coefficient estimates are reported for the five gateway cities of the 24 markets included. Relative to the omitted market area of Inland Empire, CA, list prices were less likely to be used in *NYC*, *BOS*, *CHI* and *DC*, and more likely in *LA*.[7]

The marginal effects estimates for model specification 4.4 are reported in Table 5. The estimated coefficient in the probit model represents the change in the probit index resulting from a one-unit increase in the independent variable. The marginal effects indicate the change in the probability of using list price information associated with a one-unit change in the independent variable evaluated at its mean value. Thus, a 1,000 square foot increase in the size of the structure (*SQFT*) is correlated with a 0.2% decline in the probably of using a stated list price in marketing the property (or a 100,000 square foot change, the approximate standard deviation of the *SQFT* variable, infers a decline in the probability of roughly 20%). Similarly, a one-unit (one year) increase in the property's age increases the probability by less than 0.1%. The quality of the property and the type of sale are important factors in determining the probability of using a list price. For example, a one-unit increase in PSF category and the marketing of Class A (*CL-A*) and multi-tenant (*MULT*) properties decreases the likelihood by 0.5%, 9.8% and 2.1%, respectively.

[6] *DIS* represents both properties coded as "distressed sales" and financial institution-owned "REO sales," as verified by CoStar analysts.
[7] Inland Empire, commonly defined as the Riverside-San Bernardino-Ontario MSA, is located east of the Los Angeles MSA.

Properties sold as coded in poor condition (*COND*) or shell (*SHL*) condition are 7.6% and 15.1% more likely to be sold using a list price. Finally, the marginal effects of properties sold as part of a tax-deferred exchange (*EXC*), a distressed sale (*DIS*), or a tenant purchase (*TEN*) are estimated to be 8.0%, 7.9% -18.5%, respectively.

[INSERT TABLE 5 AROUND HERE]

### *5.2 OLS Regression Estimates*

To examine the correlation that providing seller list price information has (if any) with transaction prices, we first estimate a standard hedonic regression. This will be used as a benchmark to contrast and compare alternative two-stage selection-corrected estimates presented in Section 5.3. Table 6 reports the OLS estimation results from Equation (2) where structure, sale year, sale conditions, and market factors are regressed on the natural logarithm of sale price, *lnSP*. The results from three step-wise models are presented and the sensitivity of the estimated coefficients to the specifications reported. Model 6.1 includes as explanatory variables the structural characteristics and a vector of time dummies indicated the year sold; Model 6.2 adds to (1) the condition of sale dummies; and Model 6.3 further includes the market location variables.

[INSERT TABLE 6 AROUND HERE]

The limited set of structure and time variables in Model 6.1 explains 61.2% of the variation in transaction prices (adj-R2 = 0.612). The explanatory power of the model increases slightly (adj-R2 = 0.620) when the condition of sale variables are included in Model 6.2, and then moderately (adj-R2 = 0.669) when the market location variables are added. Clearly the explanatory power of the hedonic model is largely dependent on *SQFT* (t-stat=118.8) and the quality of the property variables, *CL-A*, *MULT*, and *COND*. The estimated coefficient on *SQFT*, 0.019, indicates that on average a 1.9% change in the price occurs relative to a 1-unit (1,000 sq.ft.) change in *SQFT* evaluated at the mean price. Thus, a one square foot change at the mean price of $6.2 million represents a price per square of $117.80 [(6.2 million x 0.019)/1000], indicating estimated marginal price per square foot well within the bounds of the norm for this time period. In addition, the estimated coefficient on $SQFT^2$ indicates that prices increase at a decreasing rate relative to size, which is consistent with expectations. The estimated coefficient on *AGE*, however, is significant (and negative) in only Model 6.3. The relatively small effect of aging (-0.3% per year) may be due to the

higher construction standards of commercial properties coupled with more frequent renovations. Finally, the estimated coefficients on the Class A property (*CL-A*) and multi-tenant property (*MULT*) dummies indicate these properties are transacted, on average, at prices 44% and 29% greater than other properties of similar size and age. This is likely due to their higher-quality and site-specific location characteristics.

The estimated coefficients on the year dummies are evaluated relative to 2011, the omitted year. It is interesting to note that these coefficient estimates suggest market price movements similar to independent commercial property price index measures (e.g., Moody's/RCA CPPI). Differences in the coefficient estimates indicate slight price increases in prices from 2006 to 2007 followed by dramatic price declines from 2007 to 2009, follow by a price leveling or small price increases from 2009 to 2011.[8]

Of particular interest is the estimated coefficient on the *LIST* dummy, c. The estimated coefficient, c, is found to be negative and significant. Controlling for property-specific, sale condition, and market differences, properties that reveal list price information sold, on average, 15.2% less than properties marketed without list price information. This correlation is not interpreted as causal. To the degree that we are able to control for property quality in this model, this relationship suggests that list price information may serve more to "signal" to buyers specific sale conditions and the sellers' willingness to negotiate, and serve less as a behavior pricing "anchor" within the negotiations.[9] However, the two tactics cannot be considered independently. Thus, the degree of the anchoring behavior (if any) cannot be evaluated separate from the signaling effect.

Models 6.2 and 6.3 add condition of sale and location dummies to (1) to evaluate the sensitivity of the previous coefficients estimated. The estimated coefficients on the condition of sale variables are highly significant. Properties transacted as part of a 1031 tax-deferred exchange (*EXC*), purchased by the tenant (*TEN*), sold as part of a sale-leaseback (*S-LB*), and sold as a new shell (*SHL*), are estimated to have sold at substantially increased prices (i.e., ranging from 10.5% to 31.8%), holding other characteristics constant. In contrast, the estimated coefficient on DIS (distressed property sales) is -24.1%. In addition, estimates indicate substantial price variation associated with

[8] Moody's/RCA CPPI reports December-to-December U.S. commercial property price changes of -14.9%, -29.2% in 2007 and 2008.

[9] Unfortunately, because commercial properties are often marketed directly to buyers and their advisors through the brokers' network (sometimes using a bid request process), reliable time-on-market (TOM) information is not available. We suspect that the signaling is likely correlated (negatively) with TOM, but we are not able to control for this factor. In addition, information regarding specific lease terms and property occupancy rates in the dataset is not consistently reported. Observations with very low occupancy rates, if reported, have not been included in the analysis.

market location. Notably (and surprisingly), these independent variables do not materially affect the magnitude of the estimated coefficient on *LIST*.

### *5.3 Selection-Corrected Model Estimates*

In this subsection we first present an alternate hedonic specification which, because of its model identification characteristics, serves as the second stage specification in our selection-corrected model. In this alternate specification, the property characteristic variables discussed in Table 6 are replaced by estimates of the property's assessed value from the year prior to its sale. This specification assumes that the assessed values capture the "true" value variations of the properties. Because income property values are a function of income expectations and return requirements (information which is generally not publicly available), hedonic specifications using solely physical characteristics may not adequately explain income property values. Assessed values, often constructed using owner-provided property-specific income information and derived market discount rates, are likely to represent a valid explanatory variable for explaining income property values.[10]

Coefficient estimates using the alternate hedonic specification are reported in Table 7. Focusing our discussion on Model 7.1, this specification explains 65.9% of the variation in prices. This is very similar to the explanatory power of the standard hedonic specification, Model 6.3 (adj-R2 = 66.9%), which includes an identical set of control variables for sale, economic, and market conditions. The estimated coefficients on the year dummies suggest a price movement profile very similar to that reported in Table 6, and is generally consistent with independent indices and casual market observations. When compared to Model 6.3, the estimated coefficient on the condition of sale variable *EXC* is substantially dampened from 31.8% to 17.7%. Each of the other condition of sale coefficient estimates lay within two standard deviations of standard OLS model estimates previously reported. It is noted that the values estimated using this model are generally consistent with estimates reported in the literature.[11]

---

[10] See, for example, Clapp and Giacotto (1992) and Gatzlaff and Holmes (2012). To be representative, appraised values do not need to be reported at the property's full (100%) market value. The effects from the differences in market conventions (e.g., proportional values schemes) can controlled by including market area dummies within the regression model. However, the values within each market are assumed to be vertically and horizontally efficient.

[11] Holmes and Slade (2001) and Ling and Petrova (2008), for example, report that tax-motivated exchange buyers pay more than non-exchange investors by 9.5% and 15% to 35%, respectively. Hardin and Wolverton (1996) and Ling and Petrova (2010) estimate that compared to non-distressed properties, the sellers of distressed properties accept prices 22% and 13% to 15% lower, respectively. Past research, by Polonchek, Slovin, and Sushka (1990), Fisher (2004), and Grenadier (2005) among others, has shown that sale leaseback agreements can offer significant return advantages to the seller/lessee. Sirmans and Slade (2010) report that sale leaseback transactions occur at significantly higher prices

Finally, as expected, the estimated coefficients on the market dummies change substantially in response to differences in the assessed value measures across the markets. In general, Model 7.1 estimates are very similar to those reported using Model 6.3, the standard hedonic, and used as the second stage specification in the selection-correction model.

[INSERT TABLE 7 AROUND HERE]

Given the results of the probit model (Table 4), it is likely that *LIST* is selective. In other words, the price distribution on the types of properties whose sellers elect to use or not use list price information in the transaction process are most likely non-random. To control for the likelihood of heterogeneity selection bias in the *LIST* variable, a Heckman selection-corrected model is estimated.

The results of the second stage hedonic estimates of the selection-corrected model are reported in Table 7.[12] The selection-corrected model uses the probit specification from Model 4.4 to estimate the first stage and construct the inverse Mill's ratio (*IMR*). The second stage specification reported is identical to Model 7.1, and the second stage estimates of the selection-corrected model reported as Model 7.2. Models 7.1 and 7.2 can be compared to evaluate the effect of any selection bias on the coefficient estimates. The estimated coefficient ($\gamma$) on *IMR* reported for Model 2 is statistically significant ($p<0.01$).[13] Thus, the hypothesis of no selectivity is rejected.

Focusing on Model 7.2 (again, identical to the hedonic specification reported in 7.1) we note that the explanatory power of the alternative specifications are similar (Model 7.2 adj-R2 = 66.4% versus Model 7.1 adj-R2 = 65.9%). In general, the selection-corrected model estimates reinforce the results reported earlier. The estimated coefficients on *lnAV* ($\beta$ = 0.622 vs 0.632) are nearly identical. While the estimated coefficients on the year dummies changes, this would be expected if the use of LIST varies by year. It should be noted, however, that the differences *between* the coefficients for each subsequent year dummy (the annual appreciation rates) do not substantially change. Thus, the annual price movements reflected by the coefficients of the annual dummies are similar to those reported in the previous section. The estimated coefficients on the condition of sale variables *EXC*, *TEN*, *SHL* and *DIS* are

(approximately 13%). We are not aware of any studies that have estimated the effect of tenant purchases or the sale of property shells on properties. It should be noted that each of these estimates are likely highly sensitive to the property type and the period examined.

[12] The first stage estimates of the two-stage Heckman model are not reported due to space limitations.

[13] The standard errors in the selection corrected model have been adjusted.

sensitive to the specification of the selection-correction model. Because they are important explanatory variables in explaining the likelihood of using a stated list price, *LIST*, in the first stage of the selection correction model this is expected.

Of particular interest is the estimated coefficient on *LIST*. In both the standard hedonic (7.1) and the selection-corrected model (7.2), the estimated coefficient on *LIST* is significant ($p<0.01$). The coefficient's magnitude in the selection-corrected model is dampened slightly (from $c = -0.187$ in Model 7.1, to $c = -0.171$ in Model 7.2); however, the effect of the selection-correction is not dramatic. Both models, suggest the "signaling effect" of stating a list price dominates any possible anchoring effect.[14]

To look at this further, *LIST* is interacted with the assessed value, *lnAV*, and the year dummies. The estimation results are reported in Model 7.3 (OLS) and Model 7.4 (selection-corrected). Focusing on 7.4, the estimated coefficient on *LIST x lnAV* (-0.096) indicates that as assessed values increase (i.e., property values increase), the transaction prices on properties using list price information decrease relative to others that use list prices. In other words, the signaling effect increases with price (i.e., the use of list prices is associated, on average, with a larger reduction for higher price properties). More specifically, evaluated at the mean *ln(AV)*, the effect of *LIST* in 2011 (the omitted year) is estimated to be about -0.18. The use of stated list price information is associated with an 18% reduction in the price and declines 0.096% for every 1% increase in the assessed value. Of course, while revealing, the linear extrapolations using the estimated coefficients are problematic when evaluated over such a wide range of values. Therefore, so we look at the estimates by price cohort directly in Table 8.

Finally, interacting *LIST* with the year dummies indicates that the effect of *LIST* is influenced by economic conditions. For example, in a period of weak economic conditions (e.g. 2009) the signaling effect is reduced by 15.3% ($p<0.01$). Evaluated at the mean, the signaling effect is dramatically reduced to only -2.7% (-0.180 +0.153) during this period of economic weakness which is within the bounds of the estimated coefficient error. In contrast, in a strong economic period (e.g., 2005) the signaling effect is found to increase although in this case the marginal effect it is not statistically significant. Still, the estimated coefficient on the *LIST* related variables are consistent with

[14] To evaluate the robustness of *c*, the estimated coefficient on *LIST,* the Table 7 models were also estimated without including the special condition of sale observations and their respective variables *ESC*, *TEN*, *S-LB*, *SHL*, and *DIS*. For all models, *c* was not significantly different from those reported.

the idea that stated list prices serve as a signal associated with lower sale prices and the effect is found to dominate possible list price anchoring effects.[15] Furthermore, the "signaling effect" (i.e, the sellers' ability to convey property and/or seller information through list prices) increases as property values increase and decreases during periods of economic weakness.[16]

### *5.4 Model Estimates by Price Cohort*

In Section 5.3 we report that the magnitude of the list price signaling effect varies price cohort. In this section we examine the effect separately for two price cohorts: (1) properties transacted at prices between $100,000 to $10 million, and (2) properties transacted at prices between $10 million to $500 million.[17] OLS and selection-correction models specified identical to Models 7.1 and 7.2 are estimated for each price cohort and their results reported in Table 8. The estimation results for the lower-priced tier are reported in Models 8.1, 8.2, and 8.3 report. In all cases, the estimated coefficient on *LIST* is substantially less (<50%) than the identical model estimated using the entire (pooled) sample (e.g., Model 8.1 $c$ = -0. 082 versus Model 7.1 $c$ = -0. 187). Comparing the estimated coefficient of LIST in the selection corrected model (Model 8.2) yields the same results (e.g., Model 8.2 $c$ = -0. 065 versus Model 7.2 $c$ = -0. 171). Removing the special condition observations and re-estimating the selection correction model further reduces the estimated LIST coefficient (Model 8.3 $c$ = -0. 058); however, in all cases the coefficient is significantly different from zero ($p$<.01).

[INSERT TABLE 8 AROUND HERE]

The coefficient on *LIST* estimated using the higher-priced cohort ($10 million to $500 million) and the standard OLS model (Model 8.4) is -0.155. Estimates using a selection correction model do not converge and could not be reported. However, based on the previous results reported, it is reasonable to suggest that the OLS estimate

[15] We should mention that alternative model specifications that included time-on-market information were estimated with very little change in the coefficients of interest. The availability of the time-on-market data is quite limited and its reliability questionable; hence, it has not been reported.

[16] Viewing the use of list prices, very broadly, as related to the use of reserves in auctions, these results are not inconsistent with work in the auction literature. For example, Gan (2012) indicates that loss averse sellers will choose to set reserve prices (e.g., motivated sellers will choose to reveal list prices), and more sellers will prefer auctions without reserves when the market is hot (e.g., revealed list prices in a strong market provide clearer signals).

[17] While the term non-institutional grade and institutional grade properties are not formally defined, these price cohorts are selected to generally represent non-institutional ($100,000-$10 million) and institution-grade ($10 million to $500 million) properties.

represents the upper bound of the coefficient estimate on *LIST*. Thus, consistent with earlier results, the signaling effect is found to differ by price cohort and consistently dominates any possible anchoring effect.

## 6. CONCLUSION

This study examines the use (and non-use) of list price information in the process of marketing income-producing office properties. While research suggests that list prices in the housing market transaction process can serve as anchors and/or as signals, list prices are not generally stated as part of the standard commercial property listing. Given the powerful effect of first offers on outcomes, the non-use of list price information is a puzzle.

Our results indicate that list prices are less likely to be used when the transaction involve more complex properties with greater information asymmetries (i.e., larger, multi-tenant, institutional-grade properties). We speculate that the limited use of list prices may be due to the sellers' interests in both maintaining their informational advantage and not truncating higher than expected offers, especially during periods of economic growth or with more complex properties.

Using a two-stage selection correction model, we find that commercial office properties that are marketed using list price information are, on average, associated with lower transaction prices. It is important to note, however, that this correlation does not imply causation. Rather, the finding is consistent with the notion that sellers use list price information to signal specific property sale conditions (e.g., tenant quality, lease terms) and/or a willingness (or non-willingness) to negotiate a rapid sale. Consistent with this, we find the signaling effect to be more pronounced for higher priced properties and less pronounced during times of weak economic growth. Our results indicate that the strategic use (and non-use) of list prices to signal seller motivations appears to dominate possible price anchoring effects that may accompany the use of revealed list prices in the transaction process.

## 7. REFERENCES


Black, R. and Diaz, J. "The Use of Information Versus Asking Price in the Real Property Negotiation Process." *Journal of Property Research*, Vol.13, 1996.

Bokhari, S. and Geltner, D. "Loss Aversion and Anchoring in Commercial Real Estate Pricing: Empirical Evidence and Price Index Implications." *Real Estate Economics*, Vol. 39:4, 635–670, 2011.

Bucchianeri, G. and Minson, J. "Home Buyers: Anchoring or Herding? The Effect of Listing Behaviors on Housing Market Outcomes." Working Paper, University of Pennsylvania, 2011.

Clapp, J.M. and Giaccotto, C. "Estimating Price Indices for Residential Property: A Comparison of Repeat Sales and Assessed Value Methods," *Journal of American Statistical Association*, Vol. 87:418, 300-306, 1992.

Fisher, L. "The Wealth Effects of Sale and Leasebacks: New Evidence." *Real Estate Economics*, 32:4, 619–43, 2004.

Gan, Q., "Optimal Selling Mechanism, Auction Discounts, and Time on Market." *Real Estate Economics*, Forthcoming, 2012.

Galinsky, A. and Mussweiler, T. "First Offers as Anchors: The Role of Perspective-Taking and Negotiator Focus." *Journal of Personality and Social Psychology*, Vol. 81, 657-669, 2001.

Gatzlaff, D. and Holmes C. "Estimating Transaction-Based Price Indices of Local Commercial Real Estate Markets Using Public Assessment Data," *Journal of Real Estate Finance and Economics*, Forthcoming 2012.

Geltner, D., Kluger, B., and Miller, N. "Optimal Price and Selling Effort from the Perspectives of the Broker and Seller." *Real Estate Economics* (formerly the *AREUEA Journal*), Vol. 19:1, 1991.

Grenadier, S. "An Equilibrium Analysis of Real Estate Leases." *Journal of Business*, 78:4, 1173–1213. 2005.

Hardin, W., and Wolverton, L., "The Relationship between Foreclosure Status and Apartment Price," *Journal of Real Estate Research*, 12:1, 101-109, 1996.

Heckman, J. "Sample Selection Bias as a Specification Error." *Ecnometrica* Vol. 47, 153-161, 1979

Holmes, A. and Slade, B. "Do tax-deferred exchanges impact purchase phoenix apartment market." *Real Estate Economics*, 29(4), 567–588. 2001.

Horowitz, J., "The Role of the List Price in Housing Markets: Theory and an Econometric Model." *Journal of Applied Econometrics*, Vol. 7, 115-129, 1992

Kirstensen, H. and Gärling, T. "Anchor points, Reference points, and Counteroffers in Negotiations." *Goteborg Psychological Reports*, 1997a.

Kirstensen, H. and Gärling, T. "The Effects of Anchor Points and Reference Points on Negotiation Processes and Outcomes." *Goteborg Psychological Reports*, 1997b.

Knight, J., "Listing Price, Time on Market, and Ultimate Selling Price: Causes and Effects of Listing Price Changes." *Real Estate Economics*, Vol. 30, 213–237, 2002.

Knight, J., Sirmans, C., and Turnbull, G. "List Price Signaling and Buyer Behavior in the Housing Market." Journal of Real Estate Finance and Economics, Vol. 9, 177-192, 1994.

Levitt, S. and Syverson, C., 2008. "Market Distortions When Agents Are Better Informed: The Value of Information in Real Estate Transactions." *The Review of Economics and Statistics*, Vol. 90, 599-611, 2008

Ling, D. and Petrova, M. "Avoiding Taxes at Any Cost: The Economics of Tax-Deferred Real Estate Exchanges." *Journal of Real Estate Finance and Economics*, 36:367–404, 2008.

Ling, D. and Petrova, M. "Heterogeneous Investors, Negotiation Strength & Asset Prices in Private Markets: Evidence from Commercial Real Estate," Working Paper, 2010.

Northcraft, G. and Neale, M. "Experts, Amateurs, and Real Estate: An Anchoring-and-Adjustment Perspective on Property Pricing Decisions." *Organizational Behavior and Human Decision Processes*, Vol. 39, 1987.

Oesch, J., and Galinsky, A. "First Offers in Negotiations: Determinants and Effects," Working Paper, University of Toronto and Northwestern University, 2011.

Polonchek, J., Slovin, M., and Sushka, M. "Corporate Sale-and-Leasebacks and Shareholder Wealth." *Journal of Finance*, 45:1, 289–99. 1990.

Sirmans, C. and Slade, B., "Sale Leaseback Transactions: Price Premiums and Market Efficiency." *Journal of Real Estate Research*, 32:2, 221-241, 2010.

Valley, K., White, S., Neale, M., and Bazerman, M. "Agents as Information Brokers: The Effects of Information Disclosure on Negotiated Outcomes," *Organizational Behavior and Human Decision Processes*, Vol. 51, 1992.

Van Poucke, D., and Buelens, M. "Predicting the outcome of two-party price negotiation: contribution of reservation price, aspiration price, and opening offer." *Journal of Economic Psychology*, Vol. 23, 2002.

Yavas, A. and Yang, S. 1995. "The Strategic Role of Listing Price in Marketing Real Estate: Theory and Evidence." *Real Estate Economics*, Vol. 23, 347–368, 1995.

## TABLE 1: DESCRIPTIVE STATISTICS

Panel A: Non-dichotomous variables

| *Variable* | *Obs* | *Mean* | *Median* | *Min* | *Max* | *Std Dev* |
|---|---|---|---|---|---|---|
| *SP (000s)* | 25,862 | 6,199.17 | 1,221.00 | 100.00 | 498,000.00 | 23,472.60 |
| *AV (000s)* | 20,218 | 3,631.64 | 711.96 | 1.04 | 354,863.00 | 12,532.60 |
| *SQFT (000s)* | 25,862 | 30.51 | 8.00 | 2.00 | 1,429.80 | 80.08 |
| *AGE* | 25,862 | 27.41 | 24.00 | 0.00 | 100.00 | 25.27 |
| *PSF* | 25,862 | 188.64 | 160.81 | 1.82 | 2,168.02 | 138.01 |

Panel B: Dichotomous variables

| *Variable* | *Obs* | *Mean* | *Median* | *Min* | *Max* | *Std Dev* |
|---|---|---|---|---|---|---|
| *LIST* | 25,862 | 0.315 | N.A. | 0.00 | 1.00 | N.A. |
| *CL-A* | 25,862 | 0.063 | N.A. | 0.00 | 1.00 | N.A. |
| *COND* | 25,862 | 0.007 | N.A. | 0.00 | 1.00 | N.A. |
| *MULT* | 25,862 | 0.647 | N.A. | 0.00 | 1.00 | N.A. |
| *YR06* | 25,862 | 0.221 | N.A. | 0.00 | 1.00 | N.A. |
| *YR07* | 25,862 | 0.239 | N.A. | 0.00 | 1.00 | N.A. |
| *YR08* | 25,862 | 0.178 | N.A. | 0.00 | 1.00 | N.A. |
| *YR09* | 25,862 | 0.122 | N.A. | 0.00 | 1.00 | N.A. |
| *YR10* | 25,862 | 0.110 | N.A. | 0.00 | 1.00 | N.A. |
| *YR11* | 25,862 | 0.130 | N.A. | 0.00 | 1.00 | N.A. |
| *EXC* | 25,862 | 0.051 | N.A. | 0.00 | 1.00 | N.A. |
| *DIST* | 25,862 | 0.046 | N.A. | 0.00 | 1.00 | N.A. |
| *TEN* | 25,862 | 0.018 | N.A. | 0.00 | 1.00 | N.A. |
| *S-LB* | 25,862 | 0.017 | N.A. | 0.00 | 1.00 | N.A. |
| *SHL* | 25,862 | 0.008 | N.A. | 0.00 | 1.00 | N.A. |
| *NYC* | 25,862 | 0.119 | N.A. | 0.00 | 1.00 | N.A. |
| *LA* | 25,862 | 0.070 | N.A. | 0.00 | 1.00 | N.A. |
| *CHI* | 25,862 | 0.061 | N.A. | 0.00 | 1.00 | N.A. |
| *DC* | 25,862 | 0.036 | N.A. | 0.00 | 1.00 | N.A. |
| *BOS* | 25,862 | 0.040 | N.A. | 0.00 | 1.00 | N.A. |

*Notes: This table provides descriptive statistics for continuous variables (Panel A) and dichotomous variables (Panel B) used in our empirical analysis. A list of variable definitions is reported in Table 2. The transaction price, SP, the assessed value, AV, and the building size, SQFT, amounts are reported in 1,000s. N.A. denotes "not applicable."*

## TABLE 2: VARIABLE DEFINITIONS

| *Variable* | *Definition* |
|---|---|
| *LIST* | Dummy variable = 1 if seller uses a listing price, otherwise 0 |
| *SP* | Transaction price ($000s) |
| *lnSP* | Natural log of the transaction price, *SP*. |
| *AV* | Assessed value ($000) in the most recent year prior to the sale. |
| *lnAV* | Natural log of the assessed value, *AV*. |
| *SQFT* | Building square footage (000s). |
| *AGE* | Actual age of the building (years). |
| *PSF* | Categorical variable of price per square foot, with values = 1 to 12 (low to high) |
| *IMR* | Inverse mills ratio generated by selection-corrected estimates |
| *CL-A* | Dummy variable = 1 if class A office, otherwise 0 |
| *COND* | Dummy variable = 1 if classified in poor condition, otherwise 0 |
| *MULT* | Dummy variable = 1 if multi-tenancy structure, otherwise 0 |
| *YR06 to YR11* | Dummy variable = 1 if sold in respective year, otherwise 0 |
| *EXC* | Dummy variable = 1 if sold as part of 1031 exchange, otherwise 0 |
| *DIS* | Dummy variable = 1 if classified as distressed sale, otherwise 0 |
| *TEN* | Dummy variable = 1 if classified as tenant purchase, otherwise 0 |
| *S-LB* | Dummy variable = 1 if sale leaseback, otherwise 0 |
| *SHL* | Dummy variable = 1 if classified in shell condition, otherwise 0 |
| *NYC* | Dummy variable = 1 if located in New York city market, otherwise 0 |
| *LA* | Dummy variable = 1 if located in Los Angeles market, otherwise 0 |
| *CHI* | Dummy variable = 1 if located in Chicago market, otherwise 0 |
| *DC* | Dummy variable = 1 if located in Washington, DC market, otherwise 0 |
| *BOS* | Dummy variable = 1 if located in Boston market, otherwise 0 |

*Notes: This table provides a list of variable definitions. Property transactions in five U.S. "gateway" markets, New York, Los Angeles, Chicago, Washington, D.C. and Boston, are identified using dummy variables and results reported. In addition, dummies variables included for 19 other U.S. markets when estimating the models but their estimated coefficients are not reported.*

## TABLE 3: SALE AND LIST PRICE FREQUENCY

*(By Price Cohort)*

| *Price Cohort* | *No. of Sale Observations* | *% w/LIST Information* |
|---|---|---|
| *0.1M to 1M* | 10,827 | 38.9% |
| *1M to 5M* | 10,639 | 31.5% |
| *5M to 10M* | 1,787 | 21.2% |
| *10M to 50M* | 1,979 | 9.0% |
| *50M to 100M* | 342 | 3.2% |
| *100M to 500M* | 288 | 4.9% |
| *All cohorts* | 25,862 | 31.5% |

**TABLE 4: PROBIT ESTIMATE OF LIKELIHOOD OF LIST PRICE USED**

(Dep. Var. = *LIST*)

| Independent Variables | (4.1) β | (4.1) (std err) | (4.2) β | (4.2) (std err) | (4.3) β | (4.3) (std err) | (4.4) β | (4.4) (std err) |
|---|---|---|---|---|---|---|---|---|
| Intercept | -0.177 | (0.023)*** | -0.231 | (0.024)*** | -0.001 | (0.032) | 0.042 | (0.062) |
| *Property Characteristics* | | | | | | | | |
| *SQFT* | -0.006 | (2.9E-04)*** | -0.006 | (2.9E-04)*** | -0.006 | (2.9E-04)*** | -0.006 | (3.0E-04)*** |
| *AGE* | 0.001 | (3.3E-04)*** | 0.002 | (3.3E-04)*** | 0.001 | (3.4E-04)*** | 0.002 | (3.6E-04)*** |
| *PSF* | -0.030 | (0.003)*** | -0.027 | (0.003)*** | -0.016 | (0.003)*** | -0.016 | (0.003)*** |
| *CL-A* | -0.273 | (0.056)*** | -0.280 | (0.056)*** | -0.337 | (0.058)*** | -0.314 | (0.058)*** |
| *MULT* | -0.037 | (0.018)** | -0.043 | (0.018)** | -0.055 | (0.018)*** | -0.067 | (0.019)*** |
| *COND* | 0.180 | (0.098)* | 0.184 | (0.098)* | 0.235 | (0.101)** | 0.245 | (0.102)** |
| *Sale Conditions* | | | | | | | | |
| *EXC* | | | 0.186 | (0.037)*** | 0.324 | (0.040)*** | 0.256 | (0.040)*** |
| *TEN* | | | -0.483 | (0.071)*** | -0.571 | (0.073)*** | -0.595 | (0.073)*** |
| *S-LB* | | | 0.119 | (0.066)* | 0.069 | (0.069) | 0.032 | (0.070) |
| *SHL* | | | 0.607 | (0.091)*** | 0.497 | (0.092)*** | 0.487 | (0.094)*** |
| *DIS* | | | 0.447 | (0.039)*** | 0.270 | (0.040)*** | 0.254 | (0.041)*** |
| *Economic Conditions* | | | | | | | | |
| *YR06* | | | | | -1.192 | (0.034)*** | -1.195 | (0.035)*** |
| *YR07* | | | | | -0.154 | (0.029)*** | -0.156 | (0.030)*** |
| *YR08* | | | | | -0.087 | (0.030)*** | -0.086 | (0.031)*** |
| *YR09* | | | | | -0.172 | (0.032)*** | -0.170 | (0.033)*** |
| *YR10* | | | | | -0.097 | (0.033)*** | -0.098 | (0.033)*** |
| *Market Conditions* | | | | | | | | |
| *NYC* | | | | | | | -0.204 | (0.059)*** |
| *LA* | | | | | | | 0.128 | (0.063)** |
| *CHI* | | | | | | | -0.092 | (0.064) |
| *DC* | | | | | | | -0.094 | (0.072) |
| *BOS* | | | | | | | -0.199 | (0.070)*** |
| *Coefficient estimates are not reported for 19 additional city-specific market areas dummies included in Model 4.4* | | | | | | | | |
| AIC | 30,972 | | 30,734 | | 28,702 | | 28,242 | |
| Schwarz | 31,030 | | 30,832 | | 28,840 | | 28,569 | |
| N | 25,862 | | 25,862 | | 25,862 | | 25,862 | |

*Notes: This table reports the probit regression results from Equation (1) on the likelihood that the seller will use a list price in marketing commercial real estate properties. The sample used in this regression contains 25,862 office property sales in 24 real estate markets within the United States during 2006 to 2011. The dependent variable is LIST, which equals 1 if the property sale uses a listing price and 0 otherwise. The definitions of the independent variables are listed in Table 1. The standard errors are reported in parentheses. The ***, **, and * denote p <0.01, p<0.05, and p<0.1 respectively.*

**TABLE 5: MARGINAL EFFECTS ESTIMATE**

(Estimates for Model 4.4)

| Independent Variables | Marginal Effects dF/dz |
|---|---|
| *Property Characteristics* | |
| *SQFT* | -0.002 |
| *AGE* | 0.000 |
| *PSF* | -0.005 |
| *CL-A* | -0.098 |
| *MULT* | -0.021 |
| *COND* | 0.076 |
| *Sale Conditions* | |
| *EXC* | 0.080 |
| *TEN* | -0.185 |
| *S-LB* | 0.010 |
| *SHL* | 0.151 |
| *DIS* | 0.079 |
| *Economic Conditions* | |
| *YR06* | -0.371 |
| *YR07* | -0.048 |
| *YR08* | -0.027 |
| *YR09* | -0.053 |
| *YR10* | -0.030 |
| *Market Conditions* | |
| *NYC* | -0.063 |
| *LA* | 0.040 |
| *CHI* | -0.029 |
| *DC* | -0.029 |
| *BOS* | -0.062 |

*Notes: This table reports the marginal effect estimates from the probit regression model 4.4. The marginal effect estimates measure the conditional probability change in the likelihood that the seller will use a list price in marketing commercial real estate properties produced by one unit change in each of the independent variable. The sample used in this regression contains 25,862 office property sales in 24 real estate markets within the United States during 2006 to 2011. The dependent variable is LIST, which equals 1 if the property sale uses a listing price and 0 otherwise.*

**TABLE 6: REGRESSION ESTIMATES USING LIMITED STRUCTURE VARIABLES**

(OLS Dep. Var. = *lnSP*)

| Independent Variables | (6.1) OLS β | (std err) | (6.2) OLS β | (std err) | (6.3) OLS β | (std err) |
|---|---|---|---|---|---|---|
| *Intercept* | 13.329 | (0.019)*** | 13.363 | (0.019)*** | 13.406 | (0.034)*** |
| *LIST* | -0.152 | (0.012)*** | -0.154 | (0.012)*** | -0.142 | (0.011)*** |
| *SQFT* | 0.019 | (1.6E-04)*** | 0.019 | (1.6E-04)*** | 0.019 | (1.5E-04)*** |
| *SQFT²* | -1.5E-05 | (1.8E-07)*** | -1.5E-05 | (1.8E-07)*** | -1.5E-05 | (1.7E-07)*** |
| *AGE* | -9.5E-05 | (0.001) | -0.001 | (0.001) | -0.003 | (0.001)*** |
| *AGE²* | -1.9E-07 | (7.0E-06) | 5.7E-06 | (6.9E-06) | 1.8E-05 | (6.7E-06) |
| *CL-A* | 0.441 | (0.027)*** | 0.450 | (0.027)*** | 0.375 | (0.026)*** |
| *MULT* | 0.292 | (0.011)*** | 0.288 | (0.011)*** | 0.266 | (0.010)*** |
| *COND* | -0.286 | (0.064)*** | -0.277 | (0.063)*** | -0.290 | (0.059)*** |
| *YR06* | 0.515 | (0.019)*** | 0.446 | (0.019)*** | 0.442 | (0.018)*** |
| *YR07* | 0.513 | (0.018)*** | 0.452 | (0.018)*** | 0.453 | (0.017)*** |
| *YR08* | 0.396 | (0.019)*** | 0.338 | (0.019)*** | 0.358 | (0.018)*** |
| *YR09* | 0.026 | (0.021) | -0.009 | (0.021) | 0.005 | (0.019) |
| *YR10* | 0.029 | (0.021) | 0.018 | (0.021) | 0.026 | (0.020) |
| *EXC* | | | 0.451 | (0.024)*** | 0.318 | (0.022)*** |
| *TEN* | | | 0.197 | (0.039)*** | 0.183 | (0.037)*** |
| *S-LB* | | | 0.278 | (0.040)*** | 0.267 | (0.037)*** |
| *SHL* | | | 0.204 | (0.060)*** | 0.105 | (0.056)* |
| *DIS* | | | -0.264 | (0.025)*** | -0.241 | (0.024)*** |
| *NYC* | | | | | 0.128 | (0.033)*** |
| *LA* | | | | | 0.462 | (0.035)*** |
| *CHI* | | | | | -0.250 | (0.036)*** |
| *DC* | | | | | 0.255 | (0.040)*** |
| *BOS* | | | | | -0.045 | (0.039) |
| *Coefficient estimates are not reported for 19 additional city-specific market areas dummies included in Model 6.3* | | | | | | |
| *adjR²* | 0.612 | | 0.620 | | 0.669 | |
| *F* | 3,133 | | 2,344 | | 1,275 | |
| *N* | 25,862 | | 25,862 | | 25,862 | |

*Notes: This table reports the OLS hedonic regression results from equation (2) to examine the correlation that providing seller list price information has with commercial real estate transaction prices. The sample used in this regression contains 25,862 office property sales in 24 real estate markets within the United States during 2006 to 2011. The dependent variable is logarithm of sale price. The independent variables include building characteristics, sale year, sale conditions, and market factors. The definitions of the independent variables are listed in Table 1. The standard errors are reported in parentheses. The ***, **, and * denote p <0.01, p<0.05, and p<0.1 respectively.*

**TABLE 7: REGRESSION ESTIMATES USING ASSESSED VALUE INFORMATION**

(OLS Dep. Var=*lnSP*; Selection-Corrected Stage 1 Dep. Var.=*LIST*, Stage 2 Dep. Var.=*lnSP*)

| Independent Variables | (7.1) OLS β | (std err) | (7.2) Selection-corrected β | (std err) | (7.3) OLS β | (std err) | (7.4) Selection-corrected β | (std err) |
|---|---|---|---|---|---|---|---|---|
| *Intercept* | 5.132 | (0.063)*** | 4.753 | (0.067)*** | 4.949 | (0.067)*** | 4.529 | (0.071)*** |
| *LIST* | -0.187 | (0.013)*** | -0.171 | (0.013)*** | 0.960 | (0.119)*** | 1.088 | (0.118)*** |
| *lnAV* | 0.632 | (0.004)*** | 0.622 | (0.004)*** | 0.647 | (0.004)*** | 0.638 | (0.004)*** |
| *LIST*lnAV* | | | | | -0.090 | (0.009)*** | -0.096 | (0.008)*** |
| *YR06* | 0.442 | (0.021)*** | 0.336 | (0.022)*** | 0.421 | (0.025)*** | 0.329 | (0.025)*** |
| *YR07* | 0.453 | (0.020)*** | 0.368 | (0.021)*** | 0. 449 | (0.025)*** | 0.378 | (0.026)*** |
| *YR08* | 0.305 | (0.021)*** | 0.239 | (0.022)*** | 0.270 | (0.027)*** | 0.212 | (0.027)*** |
| *YR09* | -0.048 | (0.023)** | -0.134 | (0.023)*** | -0.112 | (0.028)*** | -0.185 | (0.029)*** |
| *YR10* | -0.011 | (0.024) | -0.066 | (0.024)*** | -0.026 | (0.031) | -0.072 | (0.031)** |
| *LIST*YR06* | | | | | -0.010 | (0.055) | -0.076 | (0.055) |
| *LIST*YR07* | | | | | -0.005 | (0.041) | -0.048 | (0.041) |
| *LIST*YR08* | | | | | 0.101 | (0.043)** | 0.074 | (0.042)** |
| *LIST*YR09* | | | | | 0.193 | (0.047)*** | 0.153 | (0.047)*** |
| *LIST*YR10* | | | | | 0.038 | (0.049) | 0.015 | (0.049) |
| *EXC* | 0.177 | (0.025)*** | 0.249 | (0.025)*** | 0.183 | (0.025)*** | 0.259 | (0.025)*** |
| *TEN* | 0.131 | (0.041)*** | 0.077 | (0.041)* | 0.132 | (0.041)*** | 0.077 | (0.041)** |
| *S-LB* | 0.264 | (0.043)*** | 0.271 | (0.043)*** | 0.265 | (0.043)*** | 0.271 | (0.042)*** |
| *SHL* | 0.141 | (0.086) | 0.376 | (0.087)*** | 0.130 | (0.086) | 0.375 | (0.086)*** |
| *DIS* | -0.294 | (0.030)*** | -0.165 | (0.030)*** | -0.293 | (0.030)*** | -0.162 | (0.030)*** |
| *NYC* | 1.181 | (0.037)*** | 1.155 | (0.037)*** | 1.168 | (0.037)*** | 1.141 | (0.037)*** |
| *LA* | 0.492 | (0.039)*** | 0.528 | (0.039)*** | 0.491 | (0.039)*** | 0.528 | (0.038)*** |
| *CHI* | 0.911 | (0.040)*** | 0.892 | (0.040)*** | 0.893 | (0.040)*** | 0.874 | (0.040)*** |
| *DC* | 0.385 | (0.045)*** | 0.394 | (0.044)*** | 0.367 | (0.045)*** | 0.375 | (0.044)*** |
| *BOS* | 0.198 | (0.044)*** | 0.187 | (0.043)*** | 0.181 | (0.044)*** | 0.169 | (0.043)*** |
| *IMR* | | | 0.750 | (0.045)*** | | | 0.778 | (0.045)*** |
| *Coefficient estimates are not reported for 19 additional city-specific market areas dummies included in each model.* | | | | | | | | |
| *adjR²* | 0.659 | | 0.664 | | 0.662 | | 0.667 | |
| *F* | 1,116 | | 1,108 | | 963 | | 961 | |
| *N* | 20,218 | | 20,218 | | 20,218 | | 20,218 | |

*Notes: This table reports the OLS and Heckman selection-correction regression results to examine the correlation that providing seller list price information has with commercial real estate transaction prices. The full sample contains 20,218 office property sales occurring from 2006 to 2011 within 24 US metropolitan markets. The dependent variable is logarithm of sale price. The selection-corrected model uses the probit specification from Model 3.4 to estimate the first stage (not reported) and construct the inverse Mill's ratio (IMR). The independent variables include the property assessed value, sale year, sale conditions, and market factors. The definitions of the independent variables are listed in Table 1. The heteroskedastic consistent standard errors are reported in parentheses. The ***, **, and * denote p <0.01, p<0.05, and p<0.1 respectively.*

**TABLE 8: REGRESSION ESTIMATES BY PRICE COHORT**

(OLS Dep. Var=*lnSP*; Selection-Corrected Stage 1 Dep. Var.=*LIST*, Stage 2 Dep. Var.=*lnSP*)

| | (8.1) OLS | | (8.2) Selection-corrected | | (8.3) Selection-corrected | | (8.4) OLS | |
|---|---|---|---|---|---|---|---|---|
| Independent | $100,000-$10M | | $100,000-$10M | | $100,000-$10M | | $10M-$500M | |
| Variable | β | (std err) | β | (std err) | β | (std err) | β | (std err) |
| *Intercept* | 8.033 | (0.064)*** | 7.663 | (0.065)*** | 7.831 | (0.072)*** | 8.393 | (0.277)*** |
| *LIST* | -0.082 | (0.011)*** | -0.065 | (0.011)*** | -0.058 | (0.012)*** | -0.155 | (0.050)*** |
| *lnAV* | 0.414 | (0.004)*** | 0.398 | (0.004)*** | 0.388 | (0.004)*** | 0.513 | (0.012)*** |
| *YR06* | 0.467 | (0.019)*** | 0.311 | (0.020)*** | 0.360 | (0.021)*** | -0.106 | (0.054)** |
| *YR07* | 0.441 | (0.018)*** | 0.330 | (0.018)*** | 0.339 | (0.020)*** | -0.032 | (0.053) |
| *YR08* | 0.339 | (0.019)*** | 0.250 | (0.019)*** | 0.254 | (0.021)*** | -0.073 | (0.058) |
| *YR09* | 0.026 | (0.020)*** | -0.094 | (0.020)*** | -0.109 | (0.023)*** | -0.316 | (0.072)*** |
| *YR10* | 0.038 | (0.021) | -0.031 | (0.021) | -0.024 | (0.024) | -0.282 | (0.069)*** |
| *EXC* | 0.237 | (0.023)*** | 0.329 | (0.023)*** | | | -0.013 | (0.052) |
| *TEN* | 0.130 | (0.037)* | 0.047 | (0.036) | | | -0.123 | (0.095) |
| *S-LB* | 0.242 | (0.040)*** | 0.262 | (0.040)*** | | | 0.119 | (0.076) |
| *SHL* | 0.138 | (0.074)*** | 0.420 | (0.072)*** | | | 0.615 | (0.308)** |
| *DIS* | -0.236 | (0.026)*** | -0.074 | (0.026)*** | | | -0.055 | (0.092) |
| *IMR* | | | 0.892 | (0.037)*** | 0.814 | (0.046)*** | | |
| *Coefficient estimates are not reported for 24 city-specific market areas dummies included in each model.* | | | | | | | | |
| *adj*$R^2$ | 0.471 | | 0.488 | | 0.457 | | 0.516 | |
| *F* | 457 | | 474 | | 422 | | 67 | |
| *N* | 17,972 | | 17,972 | | 15,586 | | 2,246 | |

*Notes: This table reports the OLS and Heckman selection-correction regression results to examine the correlation that providing seller list price information has with commercial real estate transaction prices. The sample contains office property sales occurring from 2006 to 2011 within 24 US metropolitan markets. The dependent variable is logarithm of sale price. The selection-corrected model uses the probit specification from Model 3.4 to estimate the first stage (not reported) and construct the inverse Mill's ratio (IMR). The independent variables include the property assessed value, sale year, sale conditions, and market factors. The definitions of the independent variables are listed in Table 1. The heteroskedastic consistent standard errors are reported in parentheses. The ***, **, and * denote p <0.01, p<0.05, and p<0.1 respectively.*