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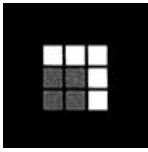

Valuation Bias in Commercial Appraisal: A Transaction Price Feedback Experiment

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Experiments were conducted to test the hypothesis that transaction price feedback may bias valuation judgment. Among participating appraisers, evidence of asymmetrical response was found. The group receiving transaction feedback indicating that current judgments were "too low" responded with judgments in subsequent, unrelated valuations that were significantly higher than the group that received no feedback. The response from "too high" feedback was in the expected direction (lower value judgments) but was not significant. Additionally, valuation dispersion of around 10% revealed in these experiments is consistent with studies of valuation variability and may reflect an upper bound of typical commercial appraisal dispersion.

According to Newell and Simon (1972) and Simon (1978), problem solving occurs in human short-term memory. Because short-term memory has serious limitations in processing capacity and speed, human problem solvers employ cognitive shortcuts called heuristics. Although heuristic behavior reduces complexity and cognitive effort, the use of these mental shortcuts can lead to systematic error called judgmental bias.

Heuristic behavior has been well documented in the expert problem-solving literature ranging from financial analysts (Biggs 1984) to physicians (Heller, Saltzstein and Caspe 1992). Heuristic behavior leading to systematic error in property valuation is of particular importance to real estate investors, managers, and lenders. Investors need accurate, unbiased estimates of market values of their real estate portfolios to make appropriate judgments about the balance between real estate and securities (such as stocks and bonds) in their overall mixed-asset portfolios. Potential appraisal bias is also important to professional real estate investment managers who operate comingled real estate funds (or "open-end" CREFs) in which investors are allowed to "buy-in" and "cash-out" based on the current appraised value of the portfolio. Mortgage lenders need to know the "true" (unbiased) loan-to-value ratio supporting the loans they issue.

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Even if purely random valuation error tends to diversify away in large portfolios, systematic bias in appraised values does not diversify.

Diaz (1990) started a research program, with theoretical roots in the psychology literature, investigating how appraisers do their work and possible heuristic behaviors leading to systematic bias in valuations. The development of valuation expertise involves both normative training and appraisal experience. A critical aspect of appraisal experience is feedback. Valuation experts face feedback from a variety of sources, for example, from the market and from clients. While the feedback of market information may play a significant role in the development of expertise, the coercive potential of client feedback has received more attention.

Rushmore (1993) and Smolen and Hambleton (1997) reported on the pervasiveness of client pressures. Roberts and Roberts (1991) speculated that client influences may represent the most frequent cause of appraisal judgment variation. Kinnard, Lenk and Worzala (1997) detected actual evidence of client influences. In a survey-delivered experiment, expert appraisers demonstrated a willingness to revise their reported value judgments to accommodate large clients. Through a series of intensive interviews of expert New Zealand valuers, Levy and Schuck (1999) concluded that reported expert value judgments are influenced by clients and further that the degree of influence varied by type of client and purpose of the valuation. Wolverton and Gallimore (1999) used a survey to discover that the perceived purpose of the valuation, from objective value opinion to price validation, can be influenced by coercive feedback.

Unlike these agency-client studies, the current study focuses on market information in the form of transaction prices as feedback. Performance feedback such as transaction prices obtained after appraisal judgment provides information needed to compare actual with ideal performance and therefore can serve to calibrate valuation judgment. The purpose of this investigation is therefore to gain insight into the extent to which expert appraisers use market information (subject transaction prices) to calibrate their subsequent valuation judgments.

Research Hypotheses

A growing literature documents sources of bias influencing real estate appraisers. Gallimore (1994) uncovered a tendency among British valuers to give too much weight to the most recently considered information (recency effect). A later study, Gallimore (1996), found a tendency among British valuers toward premature judgment. Quan and Quigley (1991), Geltner (1993), and others have theorized that appraisers rely on previous value estimates in the face of greater market uncertainty.

The extent to which appraisers are influenced by (anchor to) various reference points including the value opinions of anonymous experts, unclosed comparable sale transaction prices, and unclosed subject property transaction prices was studied in a series of experiments (Diaz 1997; Diaz and Hansz 1997, 2001). While no evidence was found in these studies that expert commercial appraisers valuing property in areas familiar to them were influenced by the opinions of anonymous experts, there was evidence that experts in unfamiliar geographic areas were. Similarly, experts operating in areas of geographic unfamiliarity were found to be susceptible to the influence of unclosed comparable property and subject property transaction prices. Diaz and Wolverton (1998) discovered that expert commercial appraisers tended to make insufficient temporal adjustments when updating a prior value judgment. This tendency to anchor on one's own previous value judgment was also discovered in a large database of appraisals analyzed in Clayton, Geltner and Hamilton (2001). Lai and Wang (1998) present an alternative view suggesting that commercial valuations are not biased.

Cho and Megbolugbe (1996) are critical of theoretical studies based on appraisal rules such as weighted averages. They focus on the appraiser's moral hazard. The institutional setting surrounding property appraisals puts a heavy burden of proof for low appraised values. The authors empirically tested their hypothesis by examining 600,000 mortgages purchased by Fannie Mae in 1993. Interestingly, they find that higher priced houses with lower loan-to-value ratios are more likely to be appraised below the pending sale price. Lenders are not as concerned with a low appraised value on a property with a low loan-to-value ratio and strong applicant income.

Chinloy, Cho and Megbolugbe (1997) recognize that residential appraisers face high costs for valuing a property below a pending sale price. Low appraised values can involve additional costs for justification and documentation. Therefore, appraisers face an asymmetric cost function with higher costs for appraised values below pending sale prices as compared to appraised values equal to or above pending sale prices. This asymmetric cost function may lead to a systematic upward bias in appraised values. Their hypothesis was empirically tested using a data set similar to that used in Cho and Megbolugbe (1996). In this sample, 95% of the appraised values were greater than or equal to the pending sale price. The authors also develop an appraisal-updating rule where "low" appraisals from previous periods are systematically adjusted upward. It is important to note that this data sample suffers from selection bias because pending sales with low appraisals are often voided, renegotiated, or do not receive conventional financing. Nevertheless, the literature suggests a significant bias in the level of valuations.

Previous literature has therefore demonstrated susceptibility of expert appraisers to a variety of specific influences. But there has not been much study of the effect of market feedback in the absence of such specific agency influences. This is the focus of the present experiment. How do appraisers respond to transaction price information on properties previously valued when they are not working for a client who has a clear interest in one direction or the other? The normative expectation in such circumstances is that market feedback (in the form of transaction price information received after the valuation judgment was made) will influence future, unrelated valuation judgments in an unbiased or symmetrical manner. That is, appraisers will respond to the new information in an equally strong manner whether that new information is on the "upside" or on the "downside." Thus, the following two research hypotheses were developed.

RH1 As compared to a control group receiving no feedback, transaction price feedback suggesting that valuations were too low given to a treatment group will result in higher valuations in a subsequent, unrelated valuation.

RH2 As compared to a control group receiving no feedback, transaction price feedback suggesting that valuations were too high given to a treatment group will result in lower valuations in a subsequent, unrelated valuation.

Methods

To examine the research hypotheses, a one-factor repeated-measures experiment was conducted. The factor of interest is feedback exercised at three levels: transaction price feedback suggesting a low previous valuation, transaction price feedback suggesting a high previous valuation, and no transaction price feedback. Participating subjects were randomly assigned to one of four experimental groups, a low feedback group, a high feedback group, a no feedback control group, and a validity control group. Expert appraisers, defined as those having an MAI (Member Appraisal Institute) designation, were randomly solicited from the Atlanta area to participate as subjects.

Experimental sessions began with a one-page demographic questionnaire. For subjects in all experimental groups except the validity control group, the subjects were next asked to complete valuation case number 1 (V1) requiring an opinion of market value. After completing the first case, the subject was invited to take a short break. During this break, subjects in the low feedback or high feedback experimental groups were administered the feedback treatment. For the feedback control group no feedback was given. Subjects were next asked to complete the second valuation case (V2) also requiring a value judgment but of a completely unrelated property. The validity control group procedures were identical except that these subjects completed only the second valuation case

Table 1 ■ Experimental design.

	Case V1	Treatment	Case V2
Low Feedback Group	I	"too low" feedback	II
High Feedback Group	III	"too high" feedback	IV
No Feedback Group	V	none	VI
Validity Control Group	not applicable	not applicable	VII

(V2). The experimental treatment, transaction price feedback, was administered to high and low feedback group subjects by supplying them with a prewritten sales report statement after the first valuation. For members of the low feedback group, the sales statement reported a transaction price approximately 15% above the subject's estimate of value. In other words, these subjects were given feedback that their estimates had been "too low." For members of the high feedback group, the sales statement reported a transaction value approximately 15% below the subject's estimate of value. Their estimates had been "too high." The treatment was accomplished by having a series of premade sales reports in $500 per acre intervals. The experimental administrator glanced at the subject's valuation estimate and selected from the group of premade sales reports the one appropriate to implement the treatment. Sales reports were not given to members of either the no treatment control group or the validity control group. Table 1 summarizes the overall experimental design.

The valuation cases, V1 and V2, required subjects to provide estimates of market value for unimproved industrial parcels in Pennsylvania. Appraisers in Atlanta were selected to value properties in Pennsylvania to minimize the confounding of subjects introducing their market-specific knowledge into the exercise. Subjects were screened for any specific knowledge of the Pennsylvania unimproved industrial land market. The appraisers predominately perform commercial valuations for mortgage lenders. Table 2 provides some additional information collected on the panels. The participants, on average, have almost 20 years of real estate industry experience, approximately 90% achieved at least a bachelor's degree, and all participants hold the MAI designation. Because the participants were randomly assigned to groups and no significant differences in demographic characteristics exist between groups, valuation differences between groups can be attributed to the experimental treatment.

Each case was presented in a 13-page packet that consisted of an introductory statement (instructing the appraiser to estimate market value) and five additional sections. These five substantive sections were Identification of the

Table 2 ■ Panel characteristics.

	Group				
	VC	NF	HF	LF	Total
Appraisers interviewed	10	10	10	10	40
Gender (percent female)	10%	20%	10%	10%	12.5%
Percentage commercial work	100%	88.5%	87%	91.4%	91.7%
Clients					
Mortgages lenders	63%	51.5%	60%	52%	56.6%
Insurance companies & pension funds	10.5%	6.5%	14%	14%	11.3%
Government	.5%	.5%	12.5%	7.6%	7.8%
Accountants or attorneys	6.5%	9.5%	5.5%	4.9%	6.6%
Other	19.5%	22%	8%	21.5%	17.8%
Years of real estate related experience	19.4	20.7	21.1	18.4	19.9
Highest level of formal education					
High school/some college	10%	10%	10%	10%	10%
Bachelor's degree	40%	50%	50%	50%	47.5%
Graduate degree	50%	40%	40%	40%	42.5%
Appraisal designations and certifications					
MAI	100%	100%	100%	100%	100%
SRA	10%	20%	20%	10%	15%
State certification	80%	90%	100%	100%	92.5%

VC = Validity Control Group; NF = No Valuation Feedback Group; HF = High Valuation Feedback Group; LF = Low Valuation Feedback Group; Total = all groups

Subject, Purpose of the Appraisal, Neighborhood Data (including map), Property Data (including plat and photographs), and Comparable Land Sales (including location map). The subject property of the first case (V1) was a hypothetical four-acre industrial tract in Northampton, Pennsylvania; the subject of the second case (V2) was a two-and-a-half-acre tract in Lehigh, Pennsylvania. Each case contained five comparable sales similar to the respective subject property in terms of property rights transferred, market conditions at time of sale, financing, general location, available utilities, and physical features. Sales for V1 ranged from $70,022 per acre to $100,435 per acre with a mean (median) of $85,029 ($84,727) per acre and a standard deviation of $11,337 per acre. Sales for V2 ranged from $84,796 per acre to $115,291 per acre with a mean (median) of $100,085 ($100,040) per acre and a standard deviation of $10,937 per acre. For both cases, the "as of" date of the appraisal was January 27, 1999. For V1, comparable sale transaction dates ranged from April 1998 to October

1998. For V2, the range of comparable sale dates was October 1997 to May 1998. The cases were designed to exhibit a high degree of fidelity to real world tasks, were validated by several experts, and were piloted tested with real estate graduate students from Georgia State University.

Forty Atlanta-area MAIs, 10 for each experimental group, participated in the study. Sessions were conducted from February 1999 until April 1999. Subjects took from 15 minutes to 45 minutes to complete each case. The results of these experimental sessions are discussed in the next section.

Results

Data obtained from the experimental sessions are reported in Table 3. A common danger in repeated measures experiments is often labeled "testing bias." Testing bias occurs when the act of performing a previous case influences the subject's response to the current case. The validity control group was incorporated into the experimental design to test for the presence of testing bias. Since this group only performed case V2, it received no V1 transaction price feedback. Like the validity control group, members of the no feedback control group received no V1 transaction price feedback but did, unlike the validity control group, perform case V1. Under conditions of no testing bias, the V2 valuation judgments of these two groups would not be different *(i.e.*, under condition of no testing bias, cells VI and VII from the experimental design (Table 1) would not be statistically different). Both a parametric independent samples t-test and a nonparametric Mann–Whitney test with p-values of 0.216 (assuming equal variance, 0.229 not assuming equal variance) and 0.218 respectively, revealed no significant differences between these two data groups.

Since the problem of testing bias does not appear to be troubling, the data were further analyzed. A comparison of the responses to V1 revealed no differences between the low and high feedback groups. This result is consistent with expectations since no subject received any feedback for this case. For the low feedback group versus the high feedback group the parametric and nonparametric p-values were 0.537 and 0.739. A comparison of the responses to V2 revealed statistically significant differences. Parametric and nonparametric p-values (one-tailed tests) for low versus high feedback groups were 0.001 and 0.0015. In the first case, where no one received feedback, value opinions were statistically the same. In the second case, where one group received low feedback and the other high feedback, value opinions were statistically different. This finding calls for a closer examination of research hypotheses.

Formally, RH1, that feedback suggesting low previous value judgments will result in higher valuations in subsequent, unrelated cases, is expressed as

Table 3 ■ Data: estimated value in dollars (each row contains the same subject's response to the respective case).

Experimental Group	Case V1	Case V2
Low feedback group	70,000	105,000
	80,000	110,000
	87,500	115,000
	90,000	115,000
	90,000	105,000
	95,000	110,000
	85,000	100,000
	90,000	105,000
	95,000	105,000
	103,500	112,000
	88,600	108,200
Mean standard deviation	9,092	4,962
High feedback group	80,000	100,000
	90,000	105,000
	90,000	103,000
	92,000	105,000
	95,000	105,000
	83,500	93,500
	90,000	100,000
	85,000	95,000
	91,000	100,000
	115,000	100,000
	91,150	100,650
Mean standard deviation	9,481	4,042
No feedback group	70,000	90,000
	90,000	110,000
	92,000	110,000
	85,000	100,000
	85,000	100,000
	90,000	100,000
	90,000	100,000
	90,000	100,000
	100,000	105,000
	100,000	100,000
	91,150	101,500
Mean standard deviation	8,483	5,798
Validity control group	not applicable	95,000
		100,000
		100,000
		100,000
		102,500
		105,000
		110,000
		110,000
		110,000
		115,000
		104,750
Mean standard deviation		6,286

follows:

$$D_{lf} > D_{nf}, \tag{1}$$

where

D = the central tendency of $(O_{i2} - O_{i1})$.
O_{i2} = the value opinion of the ith subject for V2.
O_{i1} = the value opinion of the ith subject for V1.
lf = the low feedback group.
nf = the no feedback group.

This statement of RH1 recognizes that under hypothesized conditions, O_{i2} will inflate with low transaction feedback as will therefore $(O_{i2} - O_{i1})$ when compared to no transaction price feedback. Test hypotheses flowing from RH1 are presented more formally in equations below.

$$\text{Ho:} \quad D_{lf} \leq D_{nf} \tag{2}$$

$$\text{Ha:} \quad D_{lf} > D_{nf} \tag{3}$$

Statistical examination of RH1 is accomplished by comparing the mean (median) difference of cells II and I to the mean (median) difference of cells VI and V (Table 1). P-values of 0.0265 (assuming equal variance, 0.0275 not assuming equal variance) and 0.0715, respectively, for the parametric independent samples t-test and the nonparametric Mann–Whitney test lend support to the rejection of Equation (2) and therefore generally support research hypothesis 1.

Research hypothesis 2, that feedback suggesting high previous value judgments will result in lower valuations in subsequent, unrelated cases, is presented in Equation (4). Equations (5) and (6) capture the resulting test hypotheses.

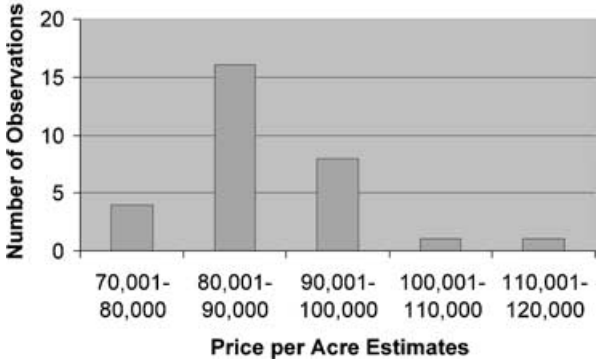
$$D_{hf} < D_{nf} \tag{4}$$

$$\text{Ho:} \quad D_{hf} \geq D_{nf} \tag{5}$$

$$\text{Ha:} \quad D_{hf} < D_{nf} \tag{6}$$

Research hypothesis 2 is examined by comparing the mean (median) difference of cells IV and III to the mean (median) difference of cells VI and V (Table 1). Both the parametric test (p-value of 0.222 assuming equal variance, 0.2225 not assuming equal variance) and the nonparametric test (p-value of 0.2645) indicate that Equation (5) cannot be rejected and therefore do not support RH2.

Figure 1 ■ Histogram of case 1 value estimates.



Evidence on Appraisal Dispersion

The data from these experiments may also be relevant to another important research issue, that of appraisal dispersion. Previous research suggests a range in valuation variability of from about 5% to 10% (see Goetzmann 1993; Geltner, Graff and Young 1994; Crosby, Lavers and Murdoch 1998; and Geltner 1998). Since case V2 was subjected to experimental manipulation, the purer indication of valuation dispersion is available from the results of case V1. In case V1, 30 expert appraisers offered independent estimates of the market value of the same asset, as of the same point in time, based on the same market and subject information. The distribution of these 30 independent value estimates is offered in Figure 1. With a mean of $89,650 and standard deviation of $8,781, the variability of these estimates as measured by the coefficient of variation (standard deviation divided by the mean) is 0.098. This is in the upper range of the previously reported estimates of valuation dispersion. Perhaps because the experiment involved experts unfamiliar with the subject area and because the appraisal of raw land can be particularly difficult, this result in the upper range of reported estimates of valuation dispersion is understandable and represents a reasonable upper bound of commercial appraisal dispersion.

Conclusions

As indicated by the coefficient of variation, data from this experiment revealed an estimate of valuation dispersion of about 10%, which may be a useful indication of the upper bound of valuation variability. The data from this study also indicate that transaction price feedback may influence future, unrelated valuation judgments since two treatment groups (high transaction price feedback

and low transaction price feedback) produce significantly different valuation estimates. The impact of this feedback does not appear to be symmetrical however. Subjects receiving transaction price feedback indicating that they had been low in previous valuations seem to adjust upwards their subsequent, unrelated value judgments. While the results for subjects receiving the "too high" feedback were in the expected direction (lower valuations), they were not statistically significant.

Why the asymmetrical response? That is, why did these expert subjects appear to give greater weight to the "too low" feedback than to the "too high" feedback? Judgment calibration motivated by a desire to improve general performance suggests that the response should be symmetrical. While no agency-client implications were built into the cases of this experiment, the findings are consistent with the view of anchoring as a routinized response to pervasive agent-client concerns and support Cho and Megbolugbe (1996) and Chinloy, Cho and Megbolugbe (1997). Valuation judgments that are too high, unlike those that are too low, rarely are of serious concern to clients. Appraisers may therefore develop a heuristic consisting of subconscious asymmetrical weights based on seriousness of consequences (*i.e.*, the asymmetrical cost function described in Chinloy, Cho and Megbolugbe 1997). Although other possible causes of the asymmetrical response cannot be ruled out, the conclusion that appraisers, operating in an environment of pervasive agent-client pressures, may subconsciously weight "too low" feedback more heavily than "too high" feedback is supported by the results of this experiment.

There are other possible causes for asymmetrical responses to transaction price feedback. For example, appraisers may tend to share a pervasive and subconscious optimism about real estate values or trends in value that leads them to overreact to positive information and underreact to negative information. Because they have self-selected into a real estate oriented profession, they may have a deep-seated affinity for real estate in general. Alternatively, appraisers may have a pervasive conservative bias (*i.e.*, a bias to estimate lower values), which is manifested more strongly the less certain or confident they are about their valuation assignment. Additional transaction price information may reduce uncertainty, increase confidence, and thereby reduce any such conservative bias, which could therefore lead to the upwardly asymmetrical result observed in this experiment. Future experiments to address the cause of the observed asymmetric behavior are now being designed and will explicitly introduce the agent-client variable.

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