Can the Federal Reserve Bank's Survey of Agricultural Credit Conditions Forecast Land Values?

by

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Abstract

The value of land dominates the financial structure of most American agricultural production firms, and land values are an important factor in long-term agricultural planning and risk management. As the primary source of collateral for farm loans, farmland values have significant implications for both producers as well as bankers financing agricultural loans. The Federal Reserve Bank of Kansas City's *Survey of Agricultural Credit Conditions* is an expert opinion survey in which agricultural bankers provide land value forecasts. As the survey has drawn increased attention, the survey has drawn criticism regarding its use qualitative data to forecast land values. Our research examines the value of the survey data with respect to its ability to forecast movement in land values. Three techniques are used in the analysis. Interpreting the aggregate forecasts as probability estimates, Brier's probability scores are used to evaluate aggregate bankers' predictions. Next, turning points are evaluated using contingency tables. Finally, Granger causality tests are used to determine the dynamic relationship between land value predictions and actual land value changes reported by bankers. Bankers' forecasts predict land values for irrigated and ranchland well, but non-irrigated forecasts were only marginally helpful in prediction non-irrigated farmland values. Forecasts provided in the survey may be beneficial, especially considering the scarcity of other publicly available data.

Keywords: farmland, forecasting, land values, Federal Reserve Bank

Introduction

Farmland is the primary source of wealth for agricultural producers and provides significant collateral for agricultural lenders. "Understanding changes in farmland values is critical to understanding the behavior of farmers and the financial performance of the agricultural sector (Henderson 2007)." Although farmland plays such an important role in agriculture, forecasting farmland values has been largely overlooked in farm financial planning. A lack of publicly available land value data further exacerbates problems of land valuation and prediction. This uncertainty regarding land prices makes timely, accurate, information on changing land values valuable.

This paper expands the knowledge of land value forecasting using the Federal Reserve Bank of Kansas City's quarterly *Survey of Agricultural Credit Conditions*. This expert opinion survey asks agricultural bankers about current and future trends in agricultural credit conditions and land values. Survey respondents provide estimates of land values and forecast the expected direction of land value movements. The survey is meant to provide timely information on agricultural credit conditions, but due to the qualitative nature of its forecasts, critics may question its true forecasting ability. The purpose of this paper is to determine the benefit of the Federal Reserve's *Survey of Agricultural Credit Conditions* with respect to its ability to forecast land values. Specifically it will address how well qualitative land value data reported by bankers corresponds to actual land values obtained from the Fed's survey.

Three techniques are used to measure the accuracy with which qualitative forecasts from the survey predict directional movement and turning points in land values. We first adopt methods used by Covey (1999) and apply Brier's probability score to evaluate bankers' forecasts. Next, contingency tables are used to estimate turning points. Using contingency table analysis, we hypothesize that the directional movement predicted by agricultural bankers highly correlates to actual land value movement. Finally, Granger causality tests are used to determine the relationship between land value predictions and actual land value changes reported by bankers. We expect to find that bankers' forecasts contribute significant information about the future change in land values. Additionally, we expect bankers' forecasts to be influenced by past land value trends.

The main benefit of the Federal Reserve's survey is its timeliness. The annual USDA report remains the primary resource for tracking land values. USDA publishes their report in August based on land values as of January 1, while the Fed releases their first quarter estimates in April with qualitative forecasts for the second quarter. In addition, since the data are released quarterly, intra-year movement and turning points in land values can be better identified. If bankers consistently predict USDA trends, anyone interested in tracking land values will have up to a six month advance notice on likely directional movement of land values.

Farmland valuation has historically been based on a present value formulation where farmland prices are determined by discounting the net present value of all expected future cash flows. These inflows were traditionally measured by net farm income or net farm rents. Divergence in farm income and farmland valuation caused researchers (Melichar 1979; McConnen 1979; and Burt 1986) to expand the basic model to include any factor that shifted net farm income.

Though the present value models explained significant variation in land values, their applications were limited. Falk (1991) noted that while the present value method described the fundamental long-run relationship between income and land value, movement away from the steady-state equilibrium could be sustained for several years. Year to year variability of production returns, interest, and inflation, coupled with uncertain government support from ever-changing policy, also make it difficult to effectively forecast the present value of future cash flows (Goodwin, Mishra, and Ortalo-Magne 2003).

The Survey of Agricultural Credit Conditions

Each quarter, the Federal Reserve Bank of Kansas City sends the *Survey of Agricultural Credit Conditions* to agricultural banks across the Federal Reserve's 10^{th} District. Agricultural banks are defined as banks that have a higher volume of agricultural than the national average (approximately 14%). Bankers from these institutions are useful to survey because they are privy to unique information concerning farmland valuation. In addition to financing the sale of land, most collateral held on agricultural loans is in the form of farmland, giving agricultural bankers a potentially strong knowledge of land values. This expertise and experience allows agricultural lenders to potentially be an effective gauge of agricultural land values, even in uncertain times.

The Federal Reserve's 10^{th} District includes the states of Colorado, Kansas, Nebraska, Oklahoma and Wyoming and includes the northern half of New Mexico and the western third of Missouri. This region yields an excellent sample by containing 650 agricultural banks which is almost 30 percent of the nation's total. From these banks, the 10^{th} District survey receives over 250 responses each quarter.

Bankers respond to questions concerning agricultural credit conditions, land values, interest rates, and capital spending. With regard to land values, the bankers provide estimates across three different classes of land values; Good quality farmland (non-irrigated), irrigated cropland, and ranchland. At the end of each quarter, each respondent provides a point estimate for local land values experienced during the period for each category of land.

In 2002, the survey was expanded to include forecasts of land values. Specifically, bankers reveal whether they expect values to increase, decrease, or remain stable in the following quarter. Thus, for any quarter (*t)*, survey respondents provide both the realized land value change from t-1 to t as well as the anticipated directional movement from t to t+1. The Fed summarizes this information by reporting the percentage change in farmland for each state as well as the percentage of bankers who believe that land will increase, decrease, and remain stable in the following quarter.

The panel contains 28 quarters from 2002:II to 2009:II. Forecasts are aggregated at the state level as well as for the entire Tenth Federal Reserve District. Due to limited responses, the states of Wyoming, Colorado, and New Mexico were combined to represent the Mountain region.

Model and Procedures

Briers' Mean Probability Score

Covey (1999) used Brier's mean probability scores to analyze land value data from the Chicago Federal Reserve Bank's *Survey of Agricultural Credit Conditions.* Each quarter, bankers provide qualitative forecasts of whether land values will increase, decrease, or remain stable in the next quarter. For any desired area, the relative percentage of banks forecasting up, down, and stable movement can be observed. Covey described these relative percentages as the probability of occurrence for each directional movement. Thus, for each period, survey respondents predict land value movement in any one of K=3 possible directions (up: k=1, no change: k=2, down: k=3). For each quarter, the percentage of bankers expecting movement in each direction represents the probability of each outcome k and is denoted $f_1, f_2, \ldots f_k$ such that:

$$\sum_{k=1}^{K} f_k = 1. \tag{1}$$

An outcome index is also created using the observed change in average land values reported by bankers in the same survey. Each quarter, the actual change in land values follows one of the K=3 directions. The values of the outcome index (d_k) assume a value of one if land values moved in the kth direction, and take a value of zero otherwise. The outcome index is denoted d_1, d_2, d_3 (up: k=1, down: k=2, no change: k=3). For each quarter, one d_k=1 and all others are equal to zero and it follows that:

$$\sum_{k=1}^{K} d_k = 1. \tag{2}$$

Covey used Brier's Probability Score (PS) to evaluate the accuracy of the probabilistic forecasts. The Probability Score is the sum of squared errors between bankers' probability forecasts and the realized outcome index:

$$PS_t = \sum_{k=1}^{K} (f_{k_t} - d_{k_t})^2 \qquad ; 0 \leq PS \leq 2. \tag{3}$$

The probability score ranges between the extreme values of zero and two. A probability score of zero represents assigning a forecast of absolute certainty to an outcome that eventually occurred. A probability score of two results from assigning a probability of zero to the occurring outcome. The Mean Probability Score ($\overline{\mathrm{PS}}$) measures the total forecast accuracy by averaging the probability scores over the sample period:

(4) $$\overline{PS} = \frac{1}{T}\sum_{t=1}^{T}\sum_{k=1}^{K}(f_{k_t} - d_{k_t})^2 \qquad ; 0 \leq \overline{PS} \leq 2.$$

From the above equation, we can also define the total mean probability score as the sum of each directional probability score:

(5) $$\boldsymbol{\overline{PS} = \overline{PS}_{down} + \overline{PS}_{stable} + \overline{PS}_{down}}.$$

Additionally, the prediction bias is calculated by observing the difference in the mean forecast probability and the mean relative frequency of the observed outcomes for each category of directional movement:

(5) $$\text{Bias} = \frac{1}{T}\left(\sum_{t=1}^{T} f_{k_t} - \sum_{t=1}^{T} d_{k_t}\right).$$

Bias is calculated for each directional movement. The bias tells us the average amount bankers over-predict or under-predict each directional movement in land values. Positive bias scores indicate that bankers were over-confident in forecasting directional movement, while negative scores indicate that bankers provided consistently low probability estimates for occurring outcomes. Optimal bias scores are zero.

Another important measure is the "slope" estimate. The slope measures the average amount by which the probability estimates change conditional on the occurrence of the forecasted outcome.

(6) $$\text{Slope} = \overline{f_c} - \overline{f_0} \qquad ; \ -1 \le \text{Slope} \le 1$$

where: $\overline{f_c} = \frac{1}{T_c} \sum_m f_{c_m} \qquad m = 1, \dots T_c$

is the conditional probability judgment for the target event over those T_c occasions when the event actually occurs; $\overline{f_0}$ is defined similarly for the remaining T_0 instances when the event does not occur, with $T = T_1 + T_0$. In the ideal case, the forecaster always provides $f_k = 1$ when the realized outcome k is going to occur and $f_k = 0$ when it is not. The slope ranges between zero and one, with one being the best possible forecast. The slope shows how bankers use information and expertise to discern when increases and decreases in land values are likely to occur. If bankers can effectively discriminate information on likely land value movements, bankers would average higher forecast probabilities for land value movement on occasions when those movements occurred. In this case, slope will be positive. The more expertise bankers demonstrate in forecasting land value movement in the following quarter, the higher the slope score will be. The optimal slope score is one. Uniform and relative frequency forecasts assign constant probabilities through time, and have slope scores of zero.

The probability forecast for bankers are measured against two models. The first is a uniform model where the probability of directional movement is equal across outcomes $\left(\boldsymbol{f_k} = \frac{\mathbf{1}}{\boldsymbol{K}} \text{ for all } k=1,\dots,K\right)$. The second is a relative frequency model which assigns probabilities based on the relative frequency of the actual outcomes ($\boldsymbol{f_k} = \overline{\boldsymbol{d_k}}$ for all $\boldsymbol{k} = \mathbf{1}, \dots, \boldsymbol{K}$). It is important to note that the second model takes advantage of future information at the time of the forecasts which provides a test of how well bankers provide forward-looking predictions.

While the score is a useful way to analyze the data, it is sensitive to the bounds and interpretations of the “stable” or “no change” category. Since the survey does not specify how much land values should change before they are no longer considered stable, the bounds of no change are arbitrarily decided by each bank. Covey observed that at least a 4% change in land values had occurred when bankers forecasted up or downtrend. Our sample is consistent with Covey’s, and we also use a $\pm$ 4% range to define the range of stable land values.

Contingency Table Analysis

Another analytical approach is to use a diffusion index which measures the relative percentage of banks predicting upward and downward movement. It is calculated as the percentage of banks forecasting upward movement (previously defined as f_1) minus the percentage of banks forecasting downward movement (previously f_3). We define the diffusion index as:

(7) $$Index_t = ({f_1}_t - {f_3}_t).$$

(8) $$\%\Delta\, Land\ Values_t = \beta_0 + \sum_{j=1}^{J} \beta_j\, \%\Delta Land\ Values_{t-1} + \sum_{j=1}^{J} \gamma_j\, Index_{t-1} + \varepsilon_t$$

where *%ΔLand Values* is the percent change in average land values obtained from bankers' survey responses, *Index* is the previously defined diffusion index, and ε_t is the white noise error term. We test $\sum \gamma_j = 0$ using joint F-tests. Due to the limited number of observations, a one-quarter lag is used. If the lagged value of *Index* is significant, then the change in the number of bankers experiencing increased land values can be predicted by the level of the prediction index relative to the outcome index in *t*-1.

We may also want to know if bankers base their forecasts off of previous land value trends. In this case, forecasts are not forward looking and do not provide information on future trends. To examine this potential problem, we use the reverse form of the above equation, placing the index value on the LHS of the equation:

(9) $$Index_t = \beta_0 + \sum_{j=1}^{J} \beta_j \, Index_{t-1} + \sum_{j=1}^{J} \gamma_j \, \%\Delta Land\ values_t + \varepsilon_{\cdot t}$$

To determine if changing land values influence bankers' predictions, we test the null of $\sum \gamma_j = 0$. By testing both variables as leading indicators of one another, we can better understand the relationship between bankers' forecasts and realized land values. If banker's forecasts are forward looking, the prediction index should Granger-cause changes in realized land values. This, however, need not be the case. It may be that bankers provide forecasts based on recent trends. In this case, land values would Granger-cause bankers' predictions. If bankers place too much weight on recent trends, their predictions would fail to be forward looking and the prediction index would contribute little relevant information about the future movement of land values.

Results

Probability Score Results

The calculated probability scores are presented in table 1. Mean probability scores are calculated across each category of land value and for each direction (up, stable, down) as well as for the total.

Table 1. Brier's Mean Probability Scores of Forecasted Land Value Movement

		Forecaster		
Land Type	Mean PS	Bankers	Uniform	Relative Frequency
Non-Irrigated	$\overline{PS}_{up}$	0.2500	0.2302	0.2296
	$\overline{PS}_{Stable}$	0.2489	0.3254	0.2296
	$\overline{PS}_{Down}$	0.0070	0.1111	0.0000
	$\overline{PS}$	0.5057	0.6667	0.4592
Irrigated	$\overline{PS}_{up}$	0.2140	0.2183	0.2205
	$\overline{PS}_{Stable}$	0.2095	0.3373	0.2205
	$\overline{PS}_{Down}$	0.0070	0.1111	0.0000
	$\overline{PS}$	0.4305	0.6667	0.4410
Ranchland	$\overline{PS}_{up}$	0.2580	0.2302	0.2309
	$\overline{PS}_{Stable}$	0.2615	0.3135	0.2398
	$\overline{PS}_{Down}$	0.0231	0.1230	0.0663
	$\overline{PS}$	0.5426	0.6667	0.5370

Bankers' mean probability scores outperform the uniform model across every farmland category. The best predictions were for irrigated cropland which had an overall mean probability score which was less than both the uniform probability model and the relative frequency model. Ranchland also had an overall mean probability score that was close to that of the relative frequency model. These results suggest that for ranchland and irrigated cropland bankers provide forward-looking predictions. The relative frequency model provided noticeably better mean probability scores for non-irrigated farmland. This suggests that bankers may not have as much information about this type of land.

The estimation of bankers' bias is presented in table 2. Bankers were least biased in assigning probabilities to downward movement. On average, bankers assigned low probabilities to upward trends and were overconfident in stable land values.

Table 2. Bankers' Bias of Forecasted Land Value Movement

		Direction		
Land Type		Down	Stable	Up
Non-Irrigated	$\bar{f}_k$	0.0481	0.7440	0.2080
	$\bar{d}_k$	0.0000	0.6429	0.3571
	Bias	0.0070	0.1111	-0.1492
Irrigated	$\bar{f}_k$	0.0507	0.7465	0.2028
	d_k	0.0000	0.6786	0.3214
	Bias	0.0507	0.0679	-0.1186
Ranchland	$\bar{f}_k$	0.0481	0.7440	0.2080
	d_k	0.0357	0.6071	0.3571
	Bias	0.0123	0.1368	-0.1492

Slope scores are in table 3. For up and stable movement, slope scores across all categories were positive. This means that bankers have some expertise, which allows them to effectively use information to discern the direction of future land value movements. For many categories, however, the slope scores are minimal and do not represent a significant improvement from unbiased models.

Table 3. Bankers' Slope Scores

		Direction		
Land Type		Down	Stable	Up
Non-Irrigated	$\bar{f}_c$	0.0000 (0)	0.7422 (18)	0.2257 (10)
	$\bar{f}_0$	0.0481 (28)	0.7470 (10)	0.1975 (18)
	Slope	-0.0481	0.0048	0.0282
Irrigated	$\bar{f}_c$	0.0000 (0)	0.7613 (19)	0.2490 (9)
	$\bar{f}_0$	0.0507 (28)	0.7153 (9)	0.1810 (19)
	Slope	-0.0507	0.0460	0.0680
Ranchland	$\bar{f}_c$	0.2755 (1)	0.7491 (17)	0.2124 (10)
	$\bar{f}_0$	0.0424 (27)	0.7424 (11)	0.1975 (18)
	Slope	0.2331	0.0067	0.0149

Note: ( ) indicates the number of observations

For downward movements, non-irrigated and irrigated cropland had negative slope scores. Since no downward movement occurred for these types of land, the greatest possible slope score is zero, and slope ranges from zero to -1. In this way, although the slope scores are negative, they are still relatively close to their optimal score of zero. Ranchland was the only type of land to experience a quarterly decline in land values of more than 4%. Bankers forecasted this event well as indicated by a high, positive slope score.

Contingency Table Turning Point Results

The results of the turning point analysis shows that bankers can forecast quarter to quarter movement well, but have a difficult time predicting declining land values. Over the 28 sample periods, bankers correctly forecasted the direction of land value movement in 19 quarters (67.8% of the time) for good quality farmland, 18 quarters (64.3%) for irrigated cropland, and 22 quarters (75.9%) for ranchland. The following table (4) summarizes these results. Forecasts were aggregated at the state level as well as for the entire Tenth Federal Reserve District. The (down) column represents the percentage of correct forecasts given downward movement in land values.

Table 4. Correct Prediction of Directional Land Value Movement from Contingency Tables

	Non-Irrigated		Irrigated		Ranchland	
State	Total Correct	(Down)	Total Correct	(Down)	Total Correct	(Down)
Kansas	19 (67.8%)	3 (33.3%)	17 (60.7%)	2 (25.0%)	20 (71.4%)	4 (36.4%)
Missouri	23 (82.4%)	2 (33.3%)	19 (67.8%)	4 (36.4%)	23 (82.1%)	2 (40.0%)
Nebraska	23 (82.1%)	4 (44.4%)	24 (84.7%)	4 (50.0%)	19 (67.9%)	3 (37.5%)
Oklahoma	18 (64.3%)	2 (20.0%)	18 (64.3%)	2 (25.0%)	20 (71.4%)	0 (0.00%)
Mountain	14 (50.0%)	3 (25.0%)	19 (67.0%)	5 (41.7%)	19 (67.9%)	6 (42.9%)
District	19 (67.8%)	2 (22.2%)	18 (64.3%)	3 (25.0%)	22 (75.9%)	3 (37.5%)

Granger Causality Results

The results from the Granger test (Table 5) show that bankers forecasts do contain some information on the likely change in land values for the next quarter. At the 5% confidence level, the null hypothesis of zero forecast coefficients could not be rejected for the District's good quality farmland. Only Missouri produced significant non-irrigated forecast coefficients at the 5% level. District *index* coefficients were significant at the 10% level.

Table 5. Granger Causality Test for the Diffusion Index as an Indicator of Changing Land Values

		Coefficient				
Type	State/Region	β_0	$\%\Delta\ LV_{t-1}$	(T-value)	$Index_{t-1}$	(T-value)
Non-Irrigated	Kansas	.02009*	-.43995**	(2.38)	.08808*	(1.96)
	Missouri	02830**	-.52262**	(-2.96)	.09920**	(2.44)
	Nebraska	02676**	-.30674	(-1.54)	.08874	(1.68)
	Oklahoma	.01624	-.31929*	(-2.02)	.06960	(1.24)
	Mountain	.05435*	-.61601**	(-3.88)	.06496	(0.55)
	District	02358**	-.03797*	(-1.97)	.04668*	(1.99)
Irrigated	Kansas	.02589	-.39510**	(-2.08)	.06826	(1.31)
	Missouri	.00617	-.66099**	(-4.18)	.30892**	(2.51)
	Nebraska	02100**	-.23812	(-1.13)	.08280*	(1.96)
	Oklahoma	.01160	-.24809	(-1.32)	.15005*	(1.92)
	Mountain	.02518	-.68317**	(-4.40)	.11275	(1.47)
	District	.01620*	-.57793**	(-3.21)	.17516**	(3.57)
Ranchland	Kansas	.01680	-.42226**	(-2.16)	.13574**	(2.15)
	Missouri	01837**	-.14374	(-0.70)	.08487**	(2.70)
	Nebraska	.02730*	-.28914	(-1.36)	.06378	(0.92)
	Oklahoma	.01101	-.19222	(-0.95)	.10834**	(2.15)
	Mountain	.00610	-.69786**	(-4.47)	.25578**	(2.19)
	District	02197**	-.34993*	(-1.77)	.09517*	(1.88)

* significant at 10%   ** significant at 5%

For Irrigated crops, District *index* coefficients were significant at the 5% level. All states, except the mountain region, produced significant *index* coefficients at the 10% level. Ranchland prediction coefficients were only significant at the district level using 10% confidence (p-value=

.0713), but were significant for all states at the 5% level with the exception of Nebraska which produced insignificant results. These results are similar to the observed probability scores. Bankers seem to be able to predict irrigated cropland and ranchland well, but supply only marginal predictions of movement for non-irrigated farmland.

Table 6. Granger Causality Test for Changing Land Values as an Indicator of Banker Prediction

		Coefficients				
Land Type	State/Region	β_0	$Index_t$	(T-value)	$\%\Delta LV_t$	(T-value)
Non-Irrigated	Kansas	.03772	.12256 **	(5.81)	.50265	(1.09)
	Missouri	.01703	.70675**	(5.27)	.57900	(1.68)
	Nebraska	.02873	.67251**	(5.06)	.85875	(1.68)
	Oklahoma	.04272	.65155**	(3.88)	.54153	(0.20)
	Mountain	.02297	.72317**	(5.31)	.09107	(0.50)
	District	.02136	.73942**	(5.95)	.50565	(1.34)
Irrigated	Kansas	.03117	.59823**	(4.50)	.80036*	(1.85)
	Missouri	.05703*	.48604**	(2.90)	.34410	(1.59)
	Nebraska	.00177	.66322**	(5.35)	1.74053**	(2.73)
	Oklahoma	.02827	.58957**	(3.62)	.31627	(0.79)
	Mountain	.02297	.72393**	(5.32)	.36263	(1.34)
	District	.02052	.67622**	(5.09)	.81307	(1.70)
Ranchland	Kansas	.02846	.67654**	(5.38)	.75310*	(1.89)
	Missouri	.01404	.55218**	(3.26)	1.68465	(1.57)
	Nebraska	.00591	.67414**	(5.47)	1.16449**	(3.10)
	Oklahoma	.05697	.61707**	(3.41)	-0.04181	(-0.06)
	Mountain	.03092	.57858**	(3.89)	.45686**	(2.28)
	District	.01094	.71841**	(5.59)	.96093*	(1.91)

* significant at 10% ** significant at 5%

For non-irrigated cropland, none of the coefficients for lagged land values were statistically significant in the reverse equation. Irrigated cropland coefficients for lagged land values were statistically significant for Kansas and Nebraska, but were not significant for the District. For ranchland, significant lagged land value coefficients for the District were observed at the 10% level, and the mountain states, Kansas, and Nebraska produced significant coefficients at the 5% level. There is some evidence that bankers use information on recent land value movement to produce forecasts for future land movement. We also notice that the prediction index is highly autocorrelated. It is interesting to note that for ranchland, Nebraska banks failed to produce forecasts that were able to predict land value movement while using land value movement to produce forecasts. On the other hand, Kansas used past information to correctly forecast land value movements in ranchland.

Conclusions

Bankers in the Federal Reserve's 10th District have some ability to forecast land value movements. Contingency table analysis showed that bankers predicted a high percentage of directional movement for ranchland, while directional forecasts for cropland yielded only marginal results. Across all land categories, bankers failed to predict downward movement well. Since this analysis eliminates the stable forecasts, it is sensitive to small changes in the average level of land values. If we set bounds of $\pm$4% for stable land values, Brier's mean probability scores show that bankers provide low biased forecasts for declining land values. In addition, bankers' expertise gives them the ability to supply forward-looking forecasts as evidenced by positive slope scores. Using an index created from the qualitative data, Granger causality tests showed that bankers' predictions could explain some variation in the future percentage change of land value. The Granger causality results showed that forecasts were the most significant indicators of changing land values at the District level for irrigated cropland. Ranchland forecasts were also significant for most states. Estimating bankers' predictions as a function of past changes in land values showed that bankers provide fairly constant forecasts from quarter to quarter. Past land value changes affect bankers land values in some instances, but most areas did not produce statistically significant effects.

These results indicate that bankers' forecasts predict land values for irrigated and ranchland well, but non-irrigated forecasts were only marginally helpful in prediction non-irrigated farmland values. Although bankers' qualitative forecasts may lack the forecasting power of other quantitative time-series techniques, they are shown to be an adequate barometer of land values. Since bankers have some discretion on land value changes, the forecasts provided in the survey may be beneficial, especially considering the scarcity of other publicly available data.

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