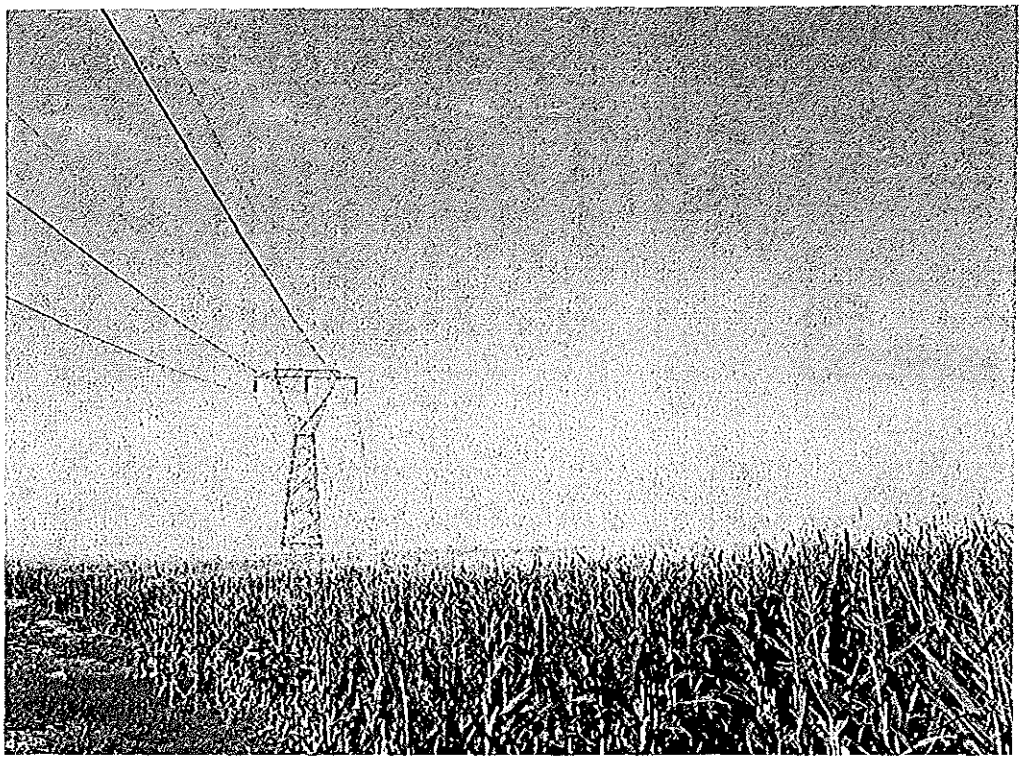
Electric Transmission Lines and Rural Land Values

FILED
December 4, 2014
Data Center
Missouri Public
Service Commission

A closer look



GBE Exhibit No. 131
Date 11-14-14 Reporter KF
File No. EA-2014-0207

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In the March/April issue of Right of Way magazine, Mr. John Schmick took issue with the findings of a study that my colleagues and I conducted, which was published in the January/February issue. This was one of a series of studies on rural land values in Wisconsin and the impacts of electric transmission lines, using a well-accepted analytic technique known as multiple regression analysis. Many of Mr. Schmick's concerns can be addressed by taking a closer look at the regression models underlying the results and findings that were only summarized in the article. The complete study will be presented at the 2011 IRWA Annual Education Conference in Atlanta.

In 2010, the Journal of Real Estate published an article titled, "The Effects of Transmission Lines on Property Values: A Literature Review," where we reviewed 19 studies published in peer-reviewed academic and professional journals. The most frequently used approach in these studies was multiple regression analysis of sales data. Our approach, methodology and findings are entirely consistent with these other studies. Nevertheless, Mr. Schmick raises some interesting points, some of which I have addressed.

"Dr. Jackson implies that high voltage transmission lines have minimal to no impact (damage) on rural land values."

The general findings were impacts from -1.1% to -2.4%. These estimates were made through the regression analyses after considering (and simultaneously adjusting or controlling for): sale date with sales occurring from 2002 to 2008, type of land (agricultural land, transitional land, etc.), number of wooded acres, number of open

acres, number of wetland acres, whether or not the sale was a government purchase, location of sale by county, and whether or not the property was encumbered with a transmission line easement.

Each of these are independent variables in the models that predict or explain differences in sales price. All of them are highly significant, except in the case of transmission lines. Overall, the models explain approximately 85% of the variances in sales price. The level of explanatory power is strong and consistent with the many other peer-reviewed statistical studies on this issue. Depending on the specification, a total of 18 independent variables were included in one model and 15 were included in a second model. These independent variables could be considered elements of comparison as used in the sales comparison approach.

"The data he provides does not support his findings."

The data does support the findings, as the regression parameter estimates (findings) are precisely and objectively determined by the data and the application of this generally accepted technique.

"The author uses a single study to develop two models."

As mentioned, the reported findings were part of a larger multipart and multiyear study. Overall, there were six models developed. Some addressed land only, some addressed land and houses, and some addressed only rural tracts with houses over various geographical areas. The overall diminution estimates from the six models ranged from 1.11% to 3.24%.

"Data selection was turned over to local appraisers... Dr. Jackson does not describe the parameters..."

We were assisted in our data collection efforts by Steigerwaldt Land Services (SLS), and in subsequent phases by John D. Rolling, Ph.D, SR/WA. Our full report describes the SLS procedure as follows:

"SLS provided hard copies of sale sheets from 147 on-line sales throughout the state of Wisconsin from its in-house database. The on-line sales were acquired through ongoing work on various projects from 2000-2008. Source data

"...there are important differences that should be considered in any appraisal-related analysis."

for each sale included a copy of the deed, any associated certified survey maps, recorded interviews, assessment information and MLS sheet, when available. SLS provided roughly three to five off-line comparable sales from its in-house database and source documents for each comparable sale. Comparable sales were selected by similar land use, property type, size and similarities in land features. The comparable sales selected were confined to the same time period and general market area as the subject on-line sale. SLS staff, using GIS-based applications, mapped all on-line and off-line sales."

Note that the number of sales (147) included properties with improvements such as houses. The analysis as reported in the original article which Mr. Schmick discussed is based solely on land sales. Other analyses address rural land sales with houses and other improvements. Through the regression modeling procedure, remaining dissimilarities and differences due to sale date, location, size, land type and other elements were held constant in order to isolate price differences due solely to the on-line/off-line characteristics. The models adjusted for this and other differences so that an apples-to-apples comparison is made in the final analysis. One sale was objectively eliminated as a statistical outlier, and three were eliminated for missing wetland data.

"If any single factor influencing value ... is omitted .., then that model may well be flawed and its conclusion meaningless."

No model or appraisal can include all variables or elements affecting the price of a property. The 18 variables in the model explained roughly 85% of the variables in the sales

prices of the 385 sales analyzed. This is a strong level of explanatory power. The models were further tested for any evidence of biased results by examining the residuals to ascertain any non-random patterns and for residual normality, patterns that might result from misspecification or omitted variable problems. (See Wolverton, An Introduction to Statistics for Appraisers, Appraisal Institute, 2009.) All adjustments and resulting on-line/off-line differences were objectively determined, and the models met all generally accepted statistical criteria for reliability.

"By stating woodland use has the strongest positive impact on sale price, the author is suggesting that non-productive woodland acres are impacted to a greater degree."

In the index model, a wooded acre was estimated to have an effect on sales price of $1,924 per acre, and an open acre has an effect of $1,418 per acre. In the categorical, the wooded acre coefficient was $1,963 and the open acre coefficient was $1,394. These differences are statistically significant, with a less than one in 1,000 chance that the observed relationships are due to chance. If the on-line sales had a greater number of wooded acres than the off-line sales, then they would be adjusted downward (as a group) so that the final comparisons would be apples-to-apples with no on-line/off-line price differences due to these or any other factors. In addition, the models contained a variable and adjustment for the price premium for agricultural land.

Unadjusted and adjusted prices.

There is a fundamental misunderstanding about this. As explained, the regression model as used in the property valuation world specifically considers the differences in various characteristics of the properties that comprise the on-line and off-line sales. The resulting adjusted mean prices are for two groups of identical properties except for the one characteristic. In the analysis we reported, the two groups of sales were essentially adjusted for the 18 variables in the model. This is at least conceptually similar to what an appraiser does in adjusting individual comparables to a subject. The regression model, though, does it for the two groups of properties, so the result is an average difference for the two groups of properties holding the other factors constant. Referring to the wooded and open acre comparison, the analysis indicates the on-line/off-line price difference for an identical property that is 45% open and 55% wooded. Wetlands have a negative effect on the value (wetlands can be wooded or open and overlap the other two categories). On average, there were 3.75 wetland acres on the tracts that averaged 50.28 acres.

"Even before adjustments, the data reflects an impact of 15.8%."

It is precisely the point of the analysis to consider and make statistically reliable and supportable adjustments for the differences in the two groups of properties that might otherwise explain this difference. If one were to stop at the simple price per acre differences, with no adjustments or further consideration of differences in the sales (date of sale, property type, size, amount of wetlands, open or wooded land and location), then a price difference that was due to another factor would be falsely ascribed to the on-line/off-line characteristic. Even with seemingly comparable properties, there are important differences that should be considered in any appraisal-related analysis.

IMPORTANT CONSIDERATIONS

As the appraisal profession matures, there is a need for more sophisticated methods and techniques. Multiple regression analysis is one such technique. It is now a required part of the curriculum for the professional designations of some organizations, such as the Appraisal Institute. Of course, the Competency Rule of USPAP is an important consideration in the use of such techniques.

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Tom is a Clinical Associate Professor of Finance in the Mays Business School at Texas A&M University in College Station. For ten years, he has taught graduate level courses on real property valuation in the Master of Real Estate Program. He is a former member of the Appraisal Standards Board of The Appraisal Foundation and a current member of the Education Committee of the Appraisal Institute. Tom also serves as a member of the Academic Review Panel and Statistics Work Group for The Appraisal Journal.