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Title: Farmland Market Experts Do Not Want to Over-predict Farmland Price Growth

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Summary We find that appraisers, ag lenders, and other farmland market experts do not want to over-predict future farmland values. When making financial decisions or interacting with appraisers and ag lenders it is important to understand the existence of this conservative bias.

Related article: Kuethe, T.H., B. Brewer, and C. Fiechter (2021). Loss Aversion in Farmland Price Expectations. *Land Economics*, Forthcoming.

Farmland is the largest asset of the farm sector balance sheet. According to the USDA, farmland constitutes approximately 83% of farm sector assets (USDA Economic Research Service, 2020). As a result, farmland is an important factor for farm financial decision making. When farmland values are expected to increase, farmland owners leverage existing land holdings to purchase more farmland (Weber and Key, 2014, 2015), and lenders provide more credit to the agricultural sector (Briggeman et al., 2009). Thus, the expected value of farmland is an important driver in investment decisions for bankers, farmers and landlords.

Expectations are an important area of inquiry for economists from many fields. One of the most prominent economic models of expectations is rational expectations (Muth, 1961). The rational expectations hypothesis posits that agents form expectations using all available sources of information efficiently, just like any other scarce resource or input. In contrast, the theory of naïve expectations assumes that the future value is the same as the value exhibited today. Naïve expectations therefore do not include all currently available information. Economists have developed models for how agents incorporate information into their *rational expectations* of asset values. These models provide a series of tests to evaluate the ability of the theory to explain what we observe happening. The tests utilize the difference between expected and observed values, or the expectations' errors.

Economic theory suggests that expectation errors should be random or free of a set pattern. Expectation errors can have patterns in two ways. The first pattern we check for is that errors do not have an equal chance of being positive or negative. This implies that the expectations have a tendency to over-predict

or under-predict observed outcomes. In other words, expectations are biased. Second, expectations can repeat over time. Over- or under-predicting in one period leads to predictable over- or under-prediction in subsequent periods. A predictable error pattern is evidence that expectations are inefficient. Previous studies have shown farmland price expectations to be irrational, both in bias and efficiency (Kuethe and Hubbs, 2017; Kuethe and Oppendahl, 2020). In a recent study, we examine the degree to which prior findings of irrationality are the results of restrictive assumptions made in testing of expectations by prior researchers. Traditional expectation tests assume that individuals consider both an over-prediction error and an under-prediction error equally, or as economists state, their loss functions are symmetric. If positive and negative errors generated different costs, then expectations may be rational once these asymmetries are considered (Elliott et. al., 2005). In other words, asymmetric loss considers the possibility that either under-prediction errors or over-predictions errors may be considered worse to the individual. This idea is similar to the economic concept of Prospect Theory developed by Kahneman and Tversky, (1979). Prospect theory suggests that individuals may not react equally to similar sized gains or losses. As an example, *winning* five dollars may not be as *good* as *losing* five dollars is *bad*.

Analysis

We test the rationality of farmland price expectation of Indiana farmland experts collected in the *Purdue Land Value and Cash Rent Survey*. Each June the survey is completed by farm managers, appraisers, land brokers, agricultural loan officers, cooperative extension personnel, and other farmland experts. Farmland experts provide farmland values for (1) the previous December, (2) the current June time period, and (3) the expectation of the coming December. These categories are requested for farmland values of (1) top quality, (2) average quality, and (3) poor quality farmland. Additionally, the survey segments Indiana into six agricultural production regions. Expectation errors are calculated by taking information from consecutive years. For example, in June 2019, the expected change in top quality farmland for 2019 in West Central Indiana is -0.8% (Dobbins (2019)), and then observed to be 2.0% in June of 2020 (Kuethe and Dobbins (2020)). These two values equate to an expectation error of 2.8%. A series of expectation errors are constructed at the state and regional level for top, average, and poor quality farmland, using survey responses from 1979 to 2020. During this period farmland values have experienced significant changes, such as the 1970's-1980's boom-bust cycle and the rapid appreciation during the commodity price boom of the early 2000's (Henderson et al., 2011, Kuethe and Hubbs, 2020).

Under conventional symmetric loss tests, 68% of farmland value expectations series exhibited bias and 55% of the expectation series exhibited information inefficiency, or repeated mistakes. Taken together, 73% of farmland expectations series can not be considered rational, consistent with the previous studies. When we allow for potential differences in the costs of under-predicting or over-predicting farmland values, these series are shown to be unbiased and efficient. Specifically, we find that farmland experts experience more loss for the over-prediction of farmland values than under-prediction. Over-prediction is estimated to be in the range of 3 to 5.7 times more costly than under-prediction. In other words, farmland market experts would strongly prefer to under-predict future values relative to over-predicting them. These results seem intuitive, especially with regard to agricultural bankers. Consider the role price expectation's play when lenders establish the collateral needed in a farmland loan. If a banker under-predicts the future value of the farmland, the result would be an advantageous position of holding more

valuable collateral. By contrast, if a bank over-predicts, they may find themselves with overvalued collateral, deficient in meeting required federal capital regulations.

Asymmetric loss in the expectations of farmland values could have many implications for the agricultural sector. In the example of the over-prediction averse banker, their aversion to loss makes sense for the financial health of the bank, as well as the financial health of the borrower. A farmland expert's conservative nature may help to shield the agricultural economy against a potential crisis, yet it may also create an unjustified credit limit for the agricultural economy. For example, Briggeman et al. (2009) suggests that U.S. agricultural production is 3% less, due to the lack of necessary credit. In addition, our study suggests that farmland owners should consider the potential for asymmetric loss when considering others' expectations of farmland values. When making financial decisions or interacting with appraisers and ag lenders, it is likely that their expectations of farmland values will be conservatively biased.

Further Reading:

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