ABSTRACT

The last few years have seen big increases in land values. Cash rents have also increased but perhaps at a slower rate than land values. This paper examines the ratio of land values to cash rents to determine how cash rents have changed in relation to land value changes. This ratio is important because it helps indicate whether cash rents are a cost effective way of controlling farmland relative to purchasing the land. Results indicate cash rents lag behind changes in land prices when land prices are increasing but not when land prices are decreasing. However, this relationship does not always hold.

The Connection Between Cash Rents and Land Values

By Gregory Ibendahl & Terry Griffin

Introduction

The last few years have seen a surge in land values as commodity prices have risen to record levels. This is to be expected as a net present value analysis of land prices would capitalize the expected future returns by an expected discount rate to arrive at a land value. Since most farmers and land investors expect commodity prices to remain above loan values for the foreseeable future, these values appear to be somewhat rational.

Real growth rates are likely being factored into the land prices seen across the country as well. The perpetual model of pricing land divides the next period's return by the discount rate minus the growth rate. Higher growth rates make the denominator smaller in the equation, which results in a higher land valuation.

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There is still a question about how cash rents should be evaluated in relation to higher land prices and higher commodity prices. First, are cash rents a leader or follower to land price changes? Arguments can probably be made both ways. The cash rent as a leader of land value argument can look at yearly profitability as setting the cash rent. Land values would follow based on a capitalization of those rents. The land price as a leader of cash rent argument can use the fact that land prices can adapt immediately while many cash rents are longer term and take longer to change. In this argument, the net income is directly capitalized into land values rather than the cash rents.

In either argument, the relationship or ratio between cash rents and land values becomes important. While the real growth rate and discount rate could affect this in the short run, over time the growth and discount rates should be stable. Given the long-term stability of the discount and growth rate, the cash rent to land value ratio in a given area of the country should also remain relatively stable over time no matter whether cash rents or land values react first. This ratio should remain stable because when the land value to rent ratio becomes large, more renting will occur as farmers rent more often instead of purchasing thus increasing rents relative to land value. When the ratio becomes small, the reverse will also occur. This paper examines the land value to rent ratio to determine its stability and to examine whether land prices support cash rents or cash rents support land values. Several different states across the country will be examined and potential models explaining the ratio will be considered.

Data and Model

There have been several papers examining cash rents and land values. Robison et al. (1985) start from the premise that land values are a function of discounted net returns and that net returns can be approximated by rent payments. If a constant discount rate is assumed, then the land value to cash rental rate should be constant. Based on data from 1960 to 1984, Robison et al. reject the model that land prices are a function of the current rental rate and a constant discount rate. They further find that inflation is an important fact to consider.

Just and Miranowski (1993) build upon Robison et al. by including the effects of inflation on capital-erosion, savings-return erosion, and real debt reduction. Just and Miranowski also include rental returns and changes in the discount rate. They found that large price swings are largely explained by inflation rates and changes in the discount rate. Moss (1997) also examined land prices as a function of inflation, net returns, and a discount rate. Returns here were a function of government programs and crop prices. Moss found that inflation was the biggest driver of land values.

Vantreese et al. (1986) is another paper using land rents, discount rate changes, and inflation to model land values. Their conclusion is that changes in the ratio between land values and rents can be partially explained by changes in discount rates and expected growth rates of land. All of the above papers assume that cash rents drive land values.

Some research has recognized that present value models do not fully explain all the movements in land values. Falk and Lee (1998) develop a farmland price model that includes three parts: a permanent component, a temporary component, and a non-fundamental component. They examined Iowa data from 1922-94 and find that fads and overreactions play a part in short-term land price movements while longer term price movements can be explained by permanent fundamental movements.

A possible limitation of the work cited is that cash rents and net returns to land represent the same thing. What is not considered is that land values are a function of net returns but that cash rents may not be representative of net returns. By allowing for land values to drive cash rents, the capitalization of cash rents does not have to equal the land value. This allows for the proposed method to calculate the rent to land value ratio that will be proposed later.

According to Ricardian Rent Theory, cash rents should reflect the level of profitability of the land. However, Hennessy and Edwards (2007) found that cash rents did not immediately reflect the changes in profitability. They reasoned that contract inertia contributed to this discrepancy.

This paper first explores the idea that cash rent changes may lag the changes in land values because of the multi-year nature of leasing contracts. Our initial thought is that because many cash rents are fixed in three to five year contracts, cash rents should lag land values. Most of the data comes from the USDA surveys of land values and cash rents. While land values have been recorded for many years, cash rent surveys generally only go back to the mid-1990's. However, we do have data from Iowa that goes much farther back.

An initial look at average farmland values in the U.S. indicate that land prices have stabilized. As shown in Figure 1, average U.S. land prices have increased much slower since 2008. However, this graph is somewhat misleading as in the major crop producing regions, land prices have continued to increase much faster than they historically have. Figure 2 shows land price increases from 2010 to 2011 for each state.

The model employed here examines the land price to cash rent ratio for Iowa. To test whether cash rent changes lag land price changes, the ratio is calculated by lagging the land values by up to five years and dividing these lagged land values by the current cash rent.

The analysis employed here is mainly an exploratory analysis. The comparisons were done by visually assessing the slope of the calculated ratios to see if lagging land values would flatten the land value to cash rent calculation over time. We assume that farmers use a constant long-term discount and growth rate and do not modify their decisions based on short-term fluctuations of growth and interest rates.

Figure 3 shows the current land value to cash rent ratio over time for the states of Mississippi, Illinois, Georgia, Ohio, Indiana, Iowa, and Minnesota. In all states, the ratio has been increasing over time while land prices have also been increasing each year. This figure would indicate that land prices have been increasing faster than cash rents.

The other thing to notice from this figure is that some states have much higher land value to cash rent ratios than in other states. In particular, Ohio is consistently higher than the other states. Whether this is because there are other factors besides farm profitability remains to be determined. By contrast, Mississippi has the lowest ratio.

An Iowa dataset going back to 1920s was used to calculate ratios of land values to land rents. During this time frame there were decreases in the land values as well as increases. Figure 4 shows how a lagging model of the ratio works with this data.

With the long-term Iowa example, the lagging model does not work very well. Notice that during the 1980's when the first farm crisis occurred, the lagging models actually makes the variability in the land price to cash rent calculation worse.

As indicated by Figure 4, the five-year lag model does not work well when land prices are decreasing but works well when land prices are increasing. This might be an indication that farmer-tenants have some control over the cash rents paid to landlords. Given the asymmetric information paradigm where tenants have more knowledge of farm profitability than do landlords, tenant influence over rents is very possible. Tenants would do all they could to delay rent increases when land prices were rising but push to lower rents whenever land prices start to fall. Under this model, we assume that land prices react instantly to profitability changes as active farmers are bidding on land in addition to other bidders.

Figure 5 shows a model where the price to rent ratio is based on using the minimum of the current land price or the five-year land price lag. Thus, as land prices rise, there is a five-year lag before land rents catch up but as land prices decline, rents adjust immediately. As shown in the figure, this revised model eliminates much of the variability that was in the five-year lag model. Figures 6, 7, and 8 confirm that a combination model where the lag changes might be a better way of examining how cash rents are influenced by land values. The combination model has the smallest variation.

Discussion

This exploratory analysis shows that lagging models might work for explaining the land value to rent ratio. However, when land prices start to decline, the model doesn't work as well. This could be an indication that cash rents only lag when land prices are increasing but do not lag when prices are declining. The Iowa data seems to bear this out indicating that farmer tenants do have a significant influence over the cash rents paid. In particular tenants can help delay cash rent increases whenever land prices are rising. Likewise, tenants can help accelerate decreases in land rents when land prices are declining.

The land value to cash rent ratio seems to average around 20 or so across agricultural states. However, there is quite a lot of variation. Some of this could be explained by the pressure on land values other than agricultural uses. Ohio has a much higher ratio than either Iowa or Mississippi. One could argue that Ohio has much greater urban influences compared to either Iowa or Mississippi.

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Figure 1. Average U.S. Real Estate Prices (Source: USDA)

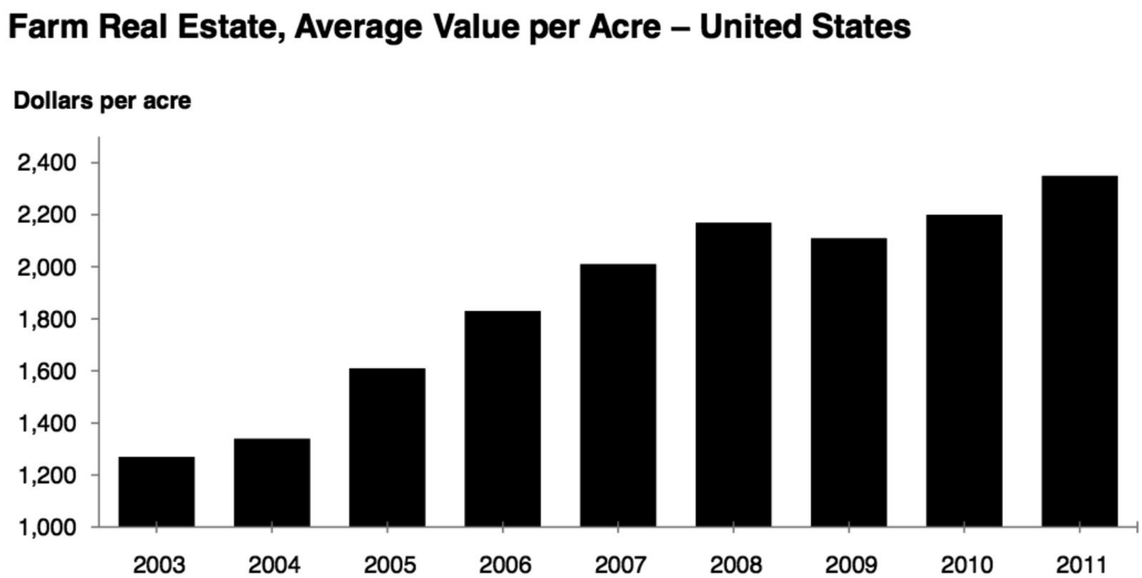


Figure 2. Percent Change from 2010 to 2011 for Farm Real Estate (Source: USDA)

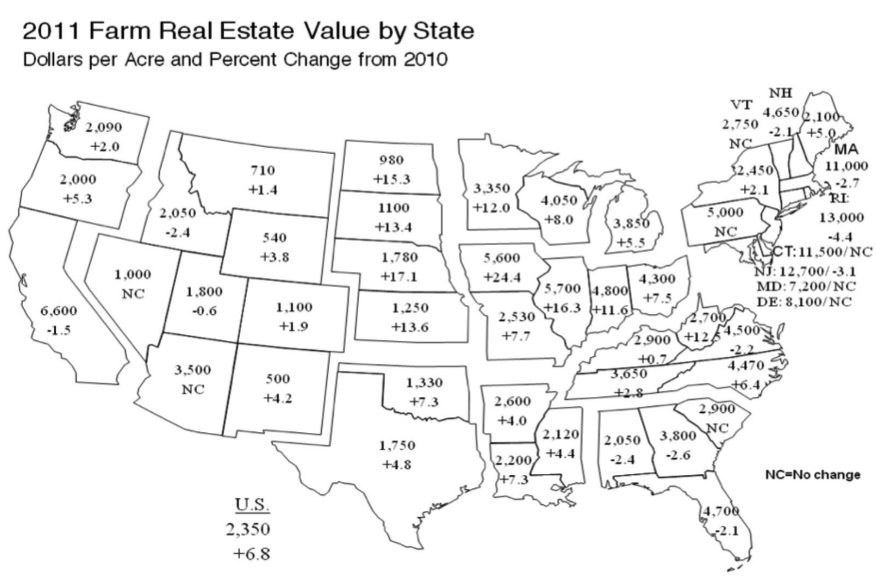


Figure 3. Current Land Value to Cash Rent Ratio for Selected States

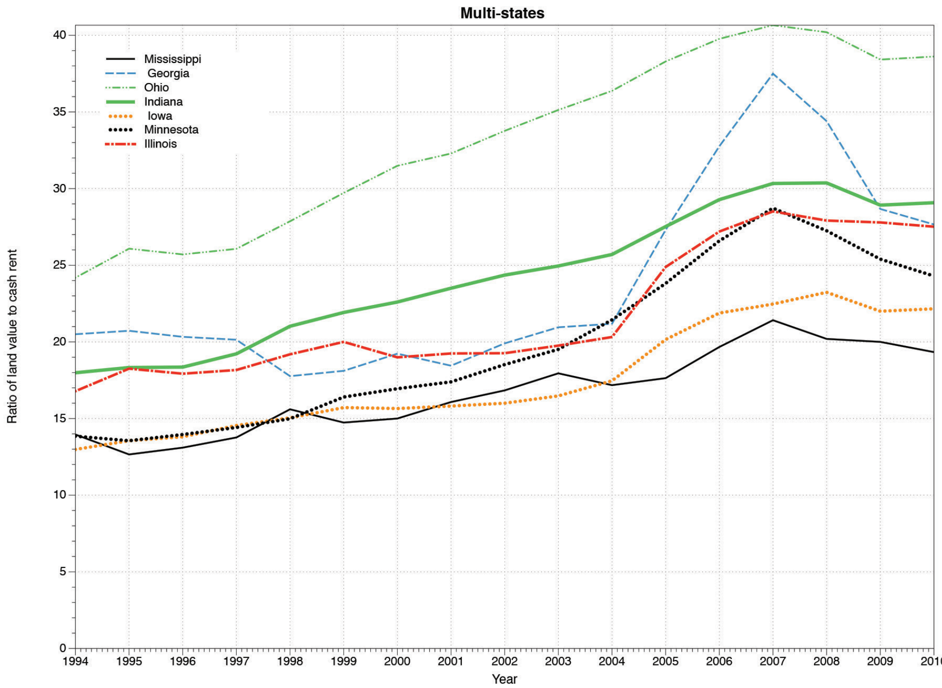


Figure 4. Land Value to Cash Rent Ratio for Iowa – A Longer Time Frame

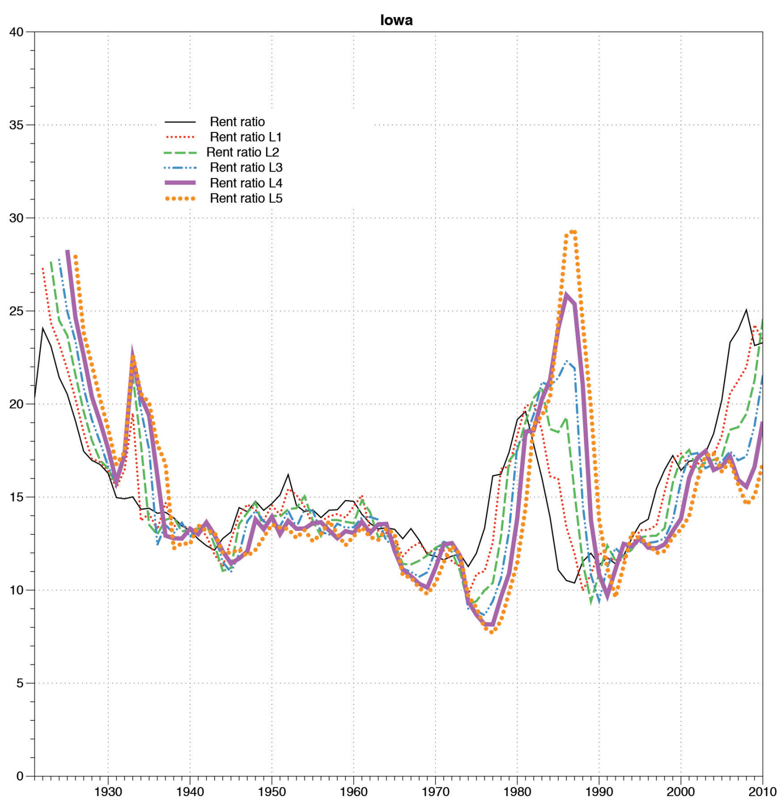


Figure 5. A Focus on the Five Year Lag Model to the Current Ratio Calculation

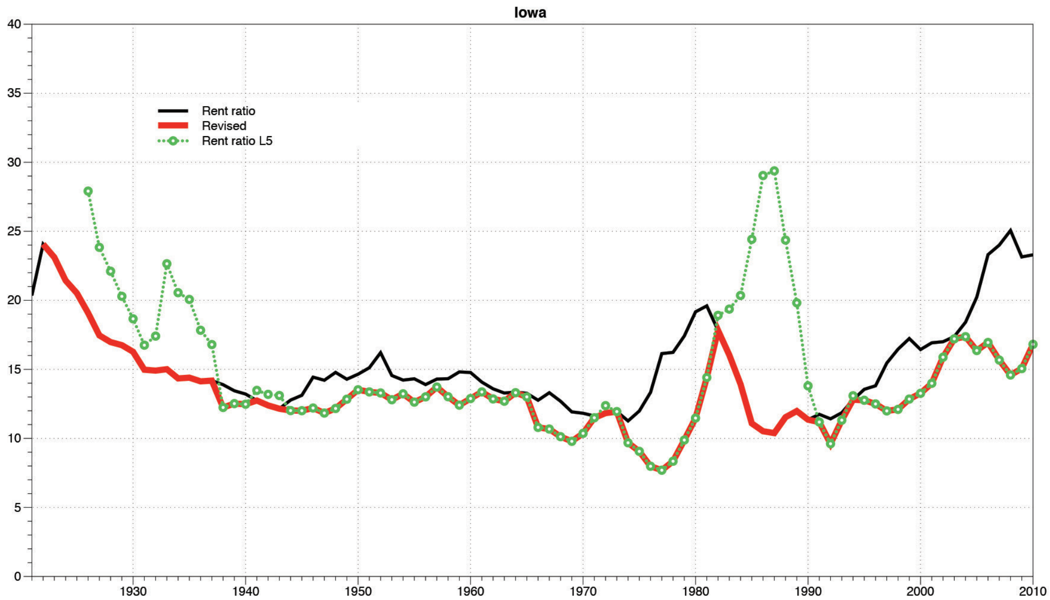
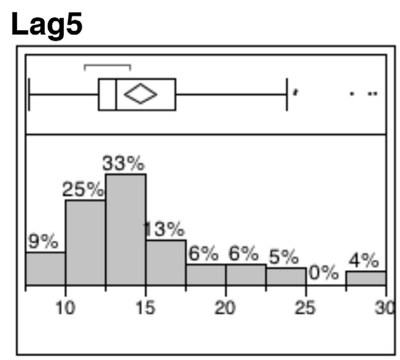


Figure 6. Effectiveness of a Five-year Lag Model

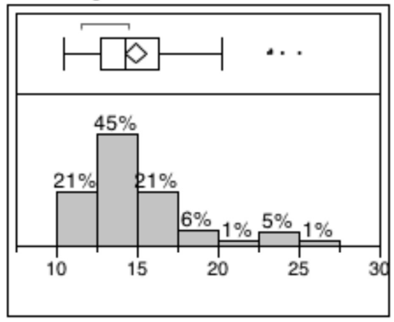


Summary Statistics

Mean	14.71
Std Dev	4.60
Std Err Mean	0.499
Upper 95% Mean	15.70
Lower 95% Mean	13.71

Figure 7. Effectiveness of a No-lag Lag Model

No_lag

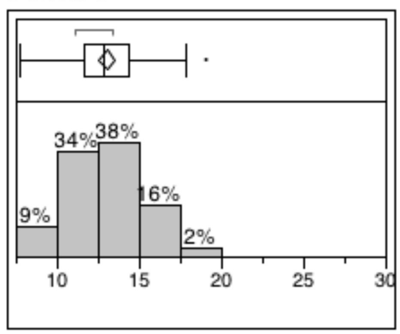


Summary Statistics

Mean	14.89
Std Dev	3.11
Std Err Mean	0.34
Upper 95% Mean	15.56
Lower 95% Mean	14.22

Figure 8. Effectiveness of the Combination Model

Combo



Summary Statistics

Mean	13.01
Std Dev	2.33
Std Err Mean	0.25
Upper 95% Mean	13.51
Lower 95% Mean	12.50