ABSTRACT

Accurate information on land values is a consequential concern when prices are changing rapidly. This study compares USDA data and sales data from 1971-2011. While the land prices from these series move in similar patterns, there are periods of substantial differences. These periods show a pattern where differences are larger when prices are changing rapidly, and where USDA prices lag sales data prices. The spread in prices in sales data is also examined. While the standard deviation of prices in a year is higher when prices are higher, the coefficient of variation, which measures relative variability, is very stable.

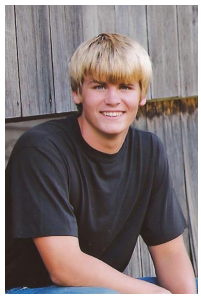
Land Prices During Periods of Rapid Change

Bryan Schurle, Allen M. Featherstone, Christine A. Wilson, and Dylan Crosson

Introduction

Producers, lenders, appraisers, and investors are interested in land prices and their rapid increase. All of these individuals desire accurate, up-to-date information about land prices, and accurate information is particularly important when prices are changing quickly. Crop incomes have been exceptionally high for several years, interest rates have been exceptionally low, and land values have responded to these conditions by rising rapidly. Although the financial condition of farms has been excellent on average, concerns about the development of an asset bubble in land values are frequently expressed (Schurle et. al, 2012). The change in land values has been so rapid that market participants may have difficulty determining land values.



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Information regarding land prices can come from government surveys and from actual sales. Previous research has examined the differences between land prices calculated from actual sales and those reported from surveys of opinions of the value of land. Land prices reported by the USDA National Agricultural Statistics Service (NASS) are from surveys of producers who provide their best estimates of what land could sell for or be appraised for in their area. Gertel (1995) compared values from actual land sales with several opinion survey-based land values estimates in Illinois and Maryland. Shultz (2006) summarizes Gertel's results for Illinois from 1983-1991: actual sales values were nine percent higher than landowner survey values, fifteen percent higher than County Director estimates, and two percent higher than real estate broker/lender estimates. Shultz went on to note that these land value differences varied considerably year by year. Average Maryland sales values from 1987 through 1991 were 27 percent higher than landowner survey values, 19 percent higher than County Director estimates, and 10 percent lower than real estate broker/lender estimates. Shultz (2006) made similar comparisons between land sales values and opinions of value for North Dakota from 2001 through 2004. He found that land value estimates were reasonably close to each other and to actual market sales, with surveys being six percent lower and nine percent lower than market sales. He went on to report that differences were not constant over time and were increasing (2004 was the last year of the data). Shultz suggested that the differences may have been increasing due to rapidly increasing land values and that opinion surveys may not have been picking up land value changes as quickly as they were occurring. Zakrzewicz et. al (2012) compare different sources of farmland values. They find that USDA and Federal Reserve land value surveys follow actual farmland value trends, and that Federal Reserve estimates provide a leading indicator of USDA estimates. Since results from these studies are not consistent there appears to be a need for more analysis of the differences in land value estimates due to data sources and how they change during rapid market change. We expand Shultz's work by extending the comparisons over a much longer period of time, 1971 through 2011. This time frame includes interesting periods with very rapid increases and decreases in land values.

A second issue that arises when examining land prices from sales is the large range in sales prices. Although the highest price often generates the most press, and is often significantly above the average price, the range is striking and needs to be examined to determine if it increases, decreases, or remains the same over time. Again, in a time when prices are changing rapidly, the range in prices may increase because of the uncertainty regarding the current price of land.

Objectives

The objectives of this research are to:

1) Examine the difference (if any) between land prices reported by NASS and land prices from actual sales over a period of years that includes the run up and decline in the 1970s and 1980s; and
2) Examine the range in prices from land sales data to determine if it is constant or if it is related

to the speed at which land values are changing. Again, this examination includes the 1970s and 1980s as well as recent years.

Comparison of USDA and Sales Price Data

We collected USDA land price data and land sales price data for 1971–2011 for the state of Kansas. Sales data were collected from the sales price data files maintained by the Kansas Society of Farm Managers and Rural Appraisers for appraisal purposes. These data allow comparison of the USDA/NASS survey data collected on the respondents' opinions of land values with sales price data. These data should allow comparisons between actual arms-length sales data and survey data over two periods when land prices were increasing rapidly, one period when they were declining, and one period when they were increasing at a much slower rate.

Sales of less than 70 acres were dropped, because they may have been influenced to a greater degree by their value as building sites. Also, if sales were influenced by the value of improvements and the value of the improvements were included, the sales prices were reduced by removing the value of improvements. This occurred for only a very small number of sales. Sales that were obviously influenced by relatively large and newer homes were eliminated from the database. Finally, sales that were for the mineral rights only or that were for commercial development purposes were eliminated from the data. This left a total of 52,265 sales over the 41-year period for an average of 1,275 sales each year, with a minimum of 890 in 2009 and a maximum of 2,086 sales in 1972. The average sales price each year was calculated as the total spent for land in that year divided by the total number of acres sold.

We anticipated divergence between NASS land prices and sales prices, and that the divergence would not be constant. We also anticipated that the divergence would be greater during periods when land prices are changing rapidly, and that a lag in NASS values is likely as producers realize what has happened to land values.

Figure 1 shows a comparison of the USDA price and Kansas Society of Farm Managers and Rural Appraisers sales price. Although land prices from the two sources track each other, some systematic differences occur during certain periods of time. Of particular interest are the differing times at which the land prices peak around 1980. The sales data hit a peak of $649 per acre in 1980, whereas the USDA land value hits a peak of $628 in 1982, a two-year lag for the survey of opinions of value. The figure also shows that USDA values are neither consistently over nor consistently under values from the sales data. Figure 2 shows the difference between the USDA price and the average sales price from the sales data. USDA land values were, on average, $89 per acre lower from 1974–1980. Then USDA land values from 1982–1997 were about $82 per acre higher on average. Since 2007, USDA land prices have been lower, and in 2011 they were $389 per acre lower than the average of the land sales data. Because land prices are substantially higher now than in past years, it is also helpful to look at the percentage differences in land prices over the period. Figure 3 shows the percentage difference

between USDA and the average land sales price. USDA land values differed substantially on a percentage basis; they were 19 percent lower from 1974–1980, 20 percent higher from 1982–1997, and 23 percent lower than the average of the land sales data in 2011.

USDA land prices appear to lag behind the sales data prices from 1971 through about 1987. Then USDA appears to overestimate sales prices from 1987 through about 2007 when prices are changing relatively slowly, and then to lag sales prices since 2007. Figure 4 shows the relationship between the percentage change in value of the sales price and the percentage difference in value between the USDA value and the sales value. The graph suggests that when prices are increasing (prior to 1981), USDA values are substantially below the sales value. When sales values are dropping (1981 through 1987), USDA values are substantially above sales values. From 1987 through 2004, the relationship is not as clear, but after 2004, increases in value again result in USDA values falling below sales values. The difference between USDA and sales prices appears to be related to whether prices are increasing or decreasing. We also can reasonably expect that the difference between USDA and sales prices to be larger when prices are changing rapidly because opinions of value would be lagging behind the market, and if the market is changing rapidly, opinions would be lagging even farther behind. To explore this relationship, we estimated the following:

Percentage Difference in Value between USDA and Sales price=f(rate of change in land values)

Table 1 reports the results of a regression model for estimating difference in land values between USDA and sales prices. The first model estimates the difference between prices as a function of the percentage change in land price from the previous year. The R-squared is 0.48, the coefficient on percentage change in land value is -0.82, and the coefficient is statistically significant. Thus, when sales prices for land had large increases, USDA land prices were significantly below sales prices, and when sales price for land price had large decreases, USDA land prices were significantly above sales prices. A two-variable model was developed, with the additional variable of a one-year lag in the change in land value. One argument is that individuals providing opinions of value may need time to realize proper value because of the size of the changes occurring in the market; thus, the additional lag variable is needed. The second model (Table 2) has an R-squared of 0.59, with both coefficients being negative and significant, which suggests that the change in land value and the lagged change in value both significantly affect the difference between USDA prices and the price calculated from sales data.

Examining the Range in Prices

The data on individual sales allow us to compare the range in prices within each year throughout the 41-year period. This set of years includes periods when prices are increasing rapidly, gradually, and declining. We anticipate an increase in the range in prices in sales data when prices are changing rapidly due to the difficulty market participants have in adjusting their price expectations under such circumstances. The range from the minimum

price to the maximum price each year was examined throughout the period. Because the range depends on two prices, and the top price is highly variable, the range was highly variable throughout the period. Although the range tended to increase in that period, land prices in general also increased. Figure 5 shows the standard deviation each year for sales prices. The standard deviation of prices increased until 1980, then dropped, then increased gradually after 1986, with a large increase in recent years. The average land price each year is included in the graph for comparison purposes. As the graph shows, the patterns in standard deviation and the average price are similar.

The coefficient of variation, which is the standard deviation divided by the average, is a measure of the variability of prices relative to the average and is a measure to use to compare variability across observations that have different means. The coefficient of variation was calculated for each year for the sales data. The average coefficient of variation was 0.62, and with the exception of a few years (1997–2003), it remained remarkably steady at around 0.6. Figure 6 shows the coefficient of variation over the 41-year period. The conclusion is that although variability increases with price increases, relative variability seems to be nearly constant for land prices when compared across years.

Summary and Conclusions

This study compared land values estimated based on surveys requesting opinions of the value of land and land values estimated from actual sales. The results suggest that opinions of value sometimes lag behind the market and that the differences in estimates of value are related to the speed at which land prices are changing. When prices are rising, land values based on opinions are lower than land values derived from sales; when prices are falling, land values based on opinions are higher than land values derived from sales. In addition, the faster land values are changing, the larger the differences between estimates based on opinions and those based on sales. This is an important finding for professionals involved in the land market, and one they should keep in mind as they use different sources of data for estimating land values.

The study also examined the distribution of land prices from sales data each year. In general, the range trended higher with higher values, but it is extremely dependent on the single high value for the year, and as such was highly variable. The variability of land price as measured by the standard deviation of land prices increased with increases in land values, but the relative variability as measured by the coefficient of variation was remarkably stable across many years. Consequently, a larger spread is likely with the high recent values, but in a relative sense, the spread is fairly similar.

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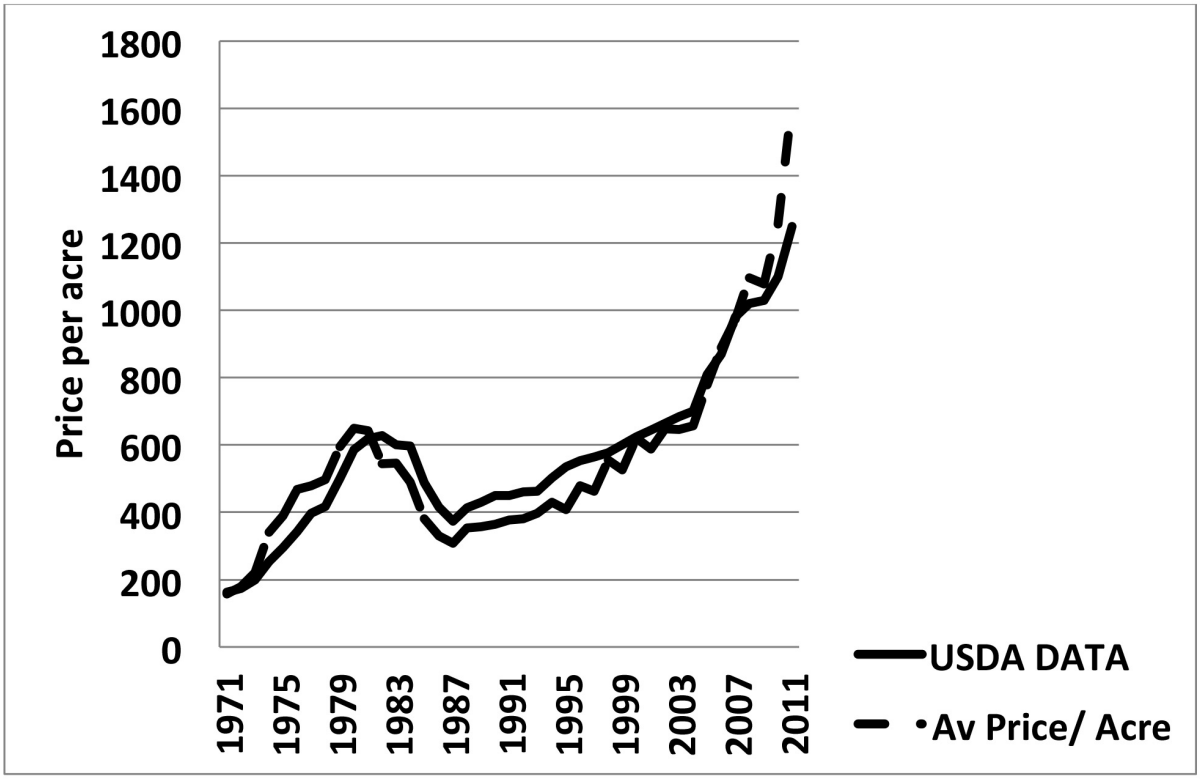
Table 1. Single-variable Difference in Land Price Model

Single variable model				
R Squared	0.48			
Adjusted R Squared	0.46			
Standard error	0.12			
Observations	40			
	Coefficients	Standard error	t stat	P-value
Intercept	0.10	0.02	4.67	0.00
Percentage change in land value	-0.82	0.14	-5.88	0.00

Table 2. Two-variable Difference in Land Price Model

Two-variable model				
R Squared	0.59			
Adjusted R Squared	0.56			
Standard error	0.11			
Observations	39			
	Coefficients	Standard error	t stat	P-value
Intercept	0.12	0.02	5.79	0.00
Percentage change in land value	-0.68	0.13	-5.05	0.00
Lagged percentage change in land value	-0.43	0.14	-3.12	0.00

Figure 1. USDA Land Price per Acre and Average Sales Price per Acres from the Kansas Society of Farm Managers and Rural Appraisers



Source: Farm, Land in Farms, and Livestock Operations Summaries: Released by National Agricultural Statistics Service (NASS), U. S. Department of Agriculture http://www.nass.usda.gov/ and Kansas Society of Farm Managers and Rural Appraisers http://www.agecon.ksu.edu/ksfmra.

Figure 2. The Difference Between the USDA Land Price per Acre and Average Sales Price per Acre from the Kansas Society of Farm Managers and Rural Appraisers

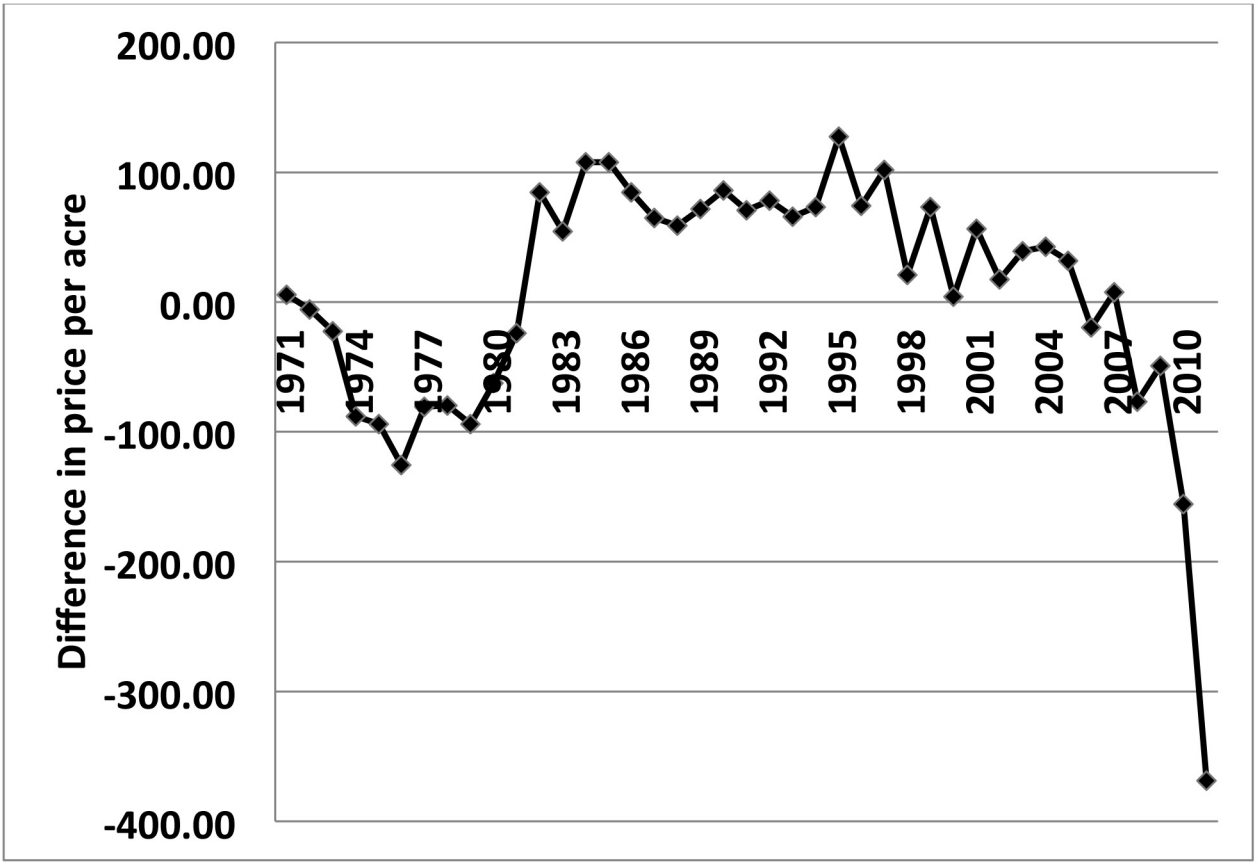


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Figure 3. The Percentage Difference Between the USDA Land Price per Acre and Average Sales Price per Acre form the Kansas Society of Farm Managers and Rural Appraisers

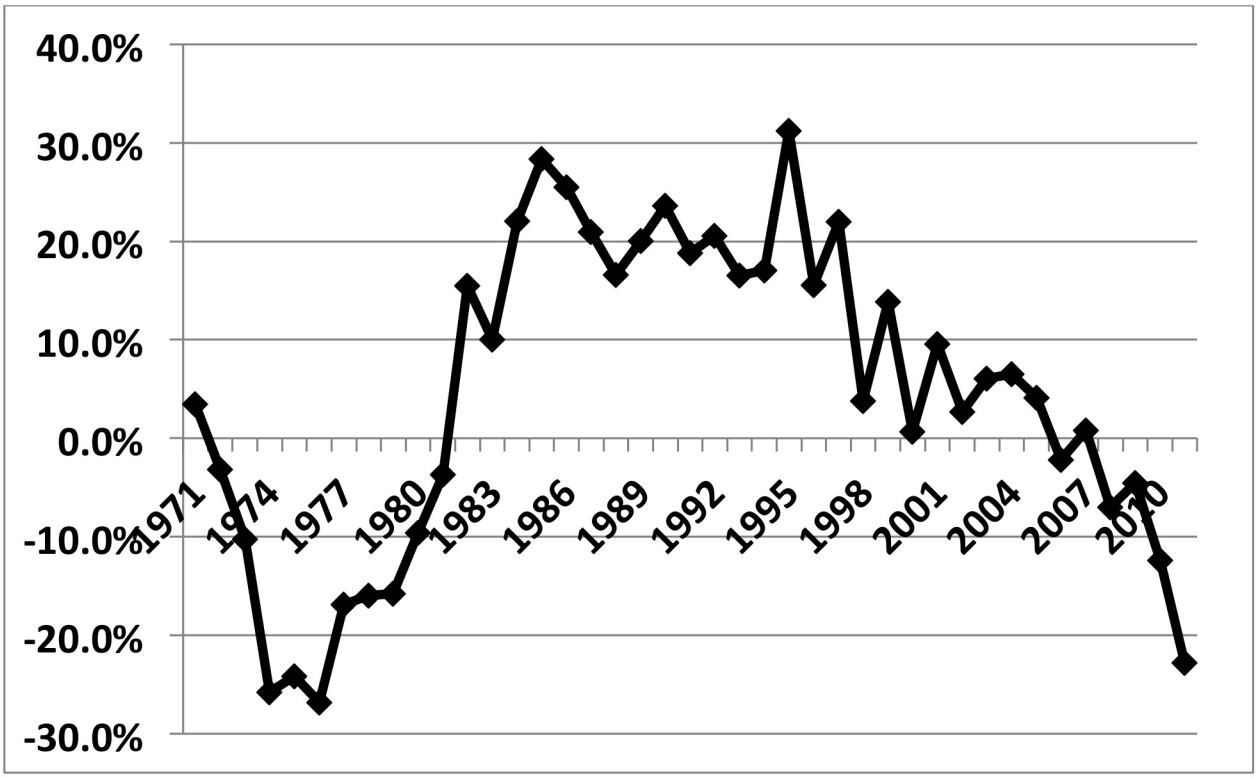

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Figure 4. The Percentage Change in Sales Price from Year to Year and Percentage Difference Between the USDA Land Price per Acre and Average Sales Price per Acre from the Kansas Society of Farm Managers and Rural Appraisers

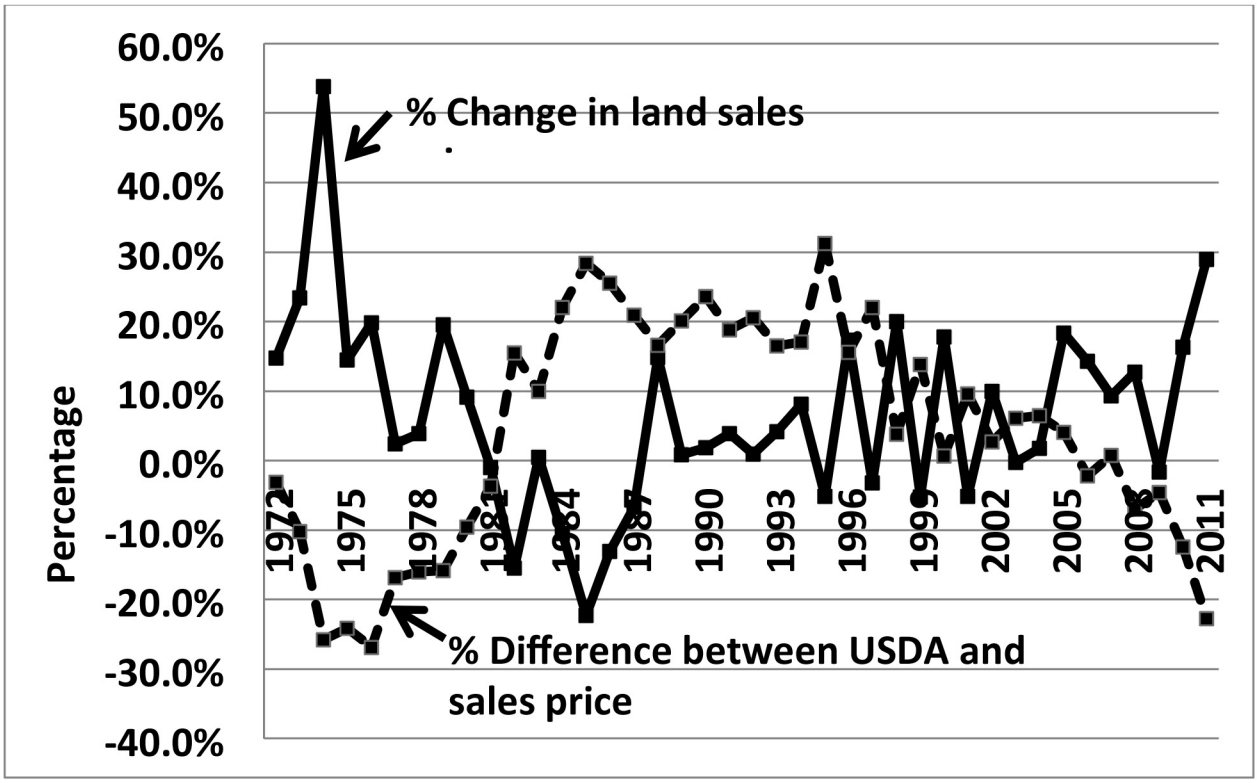

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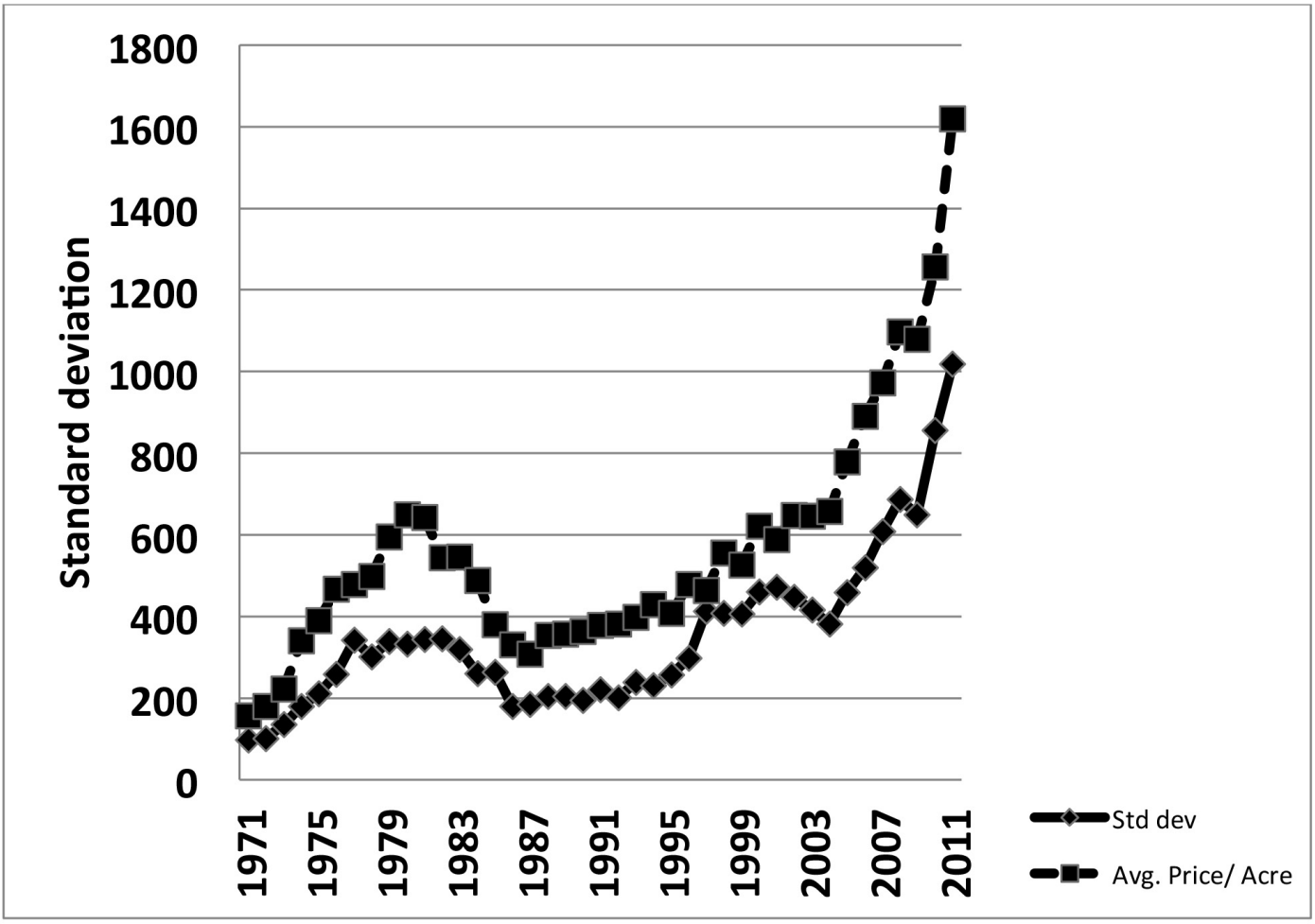
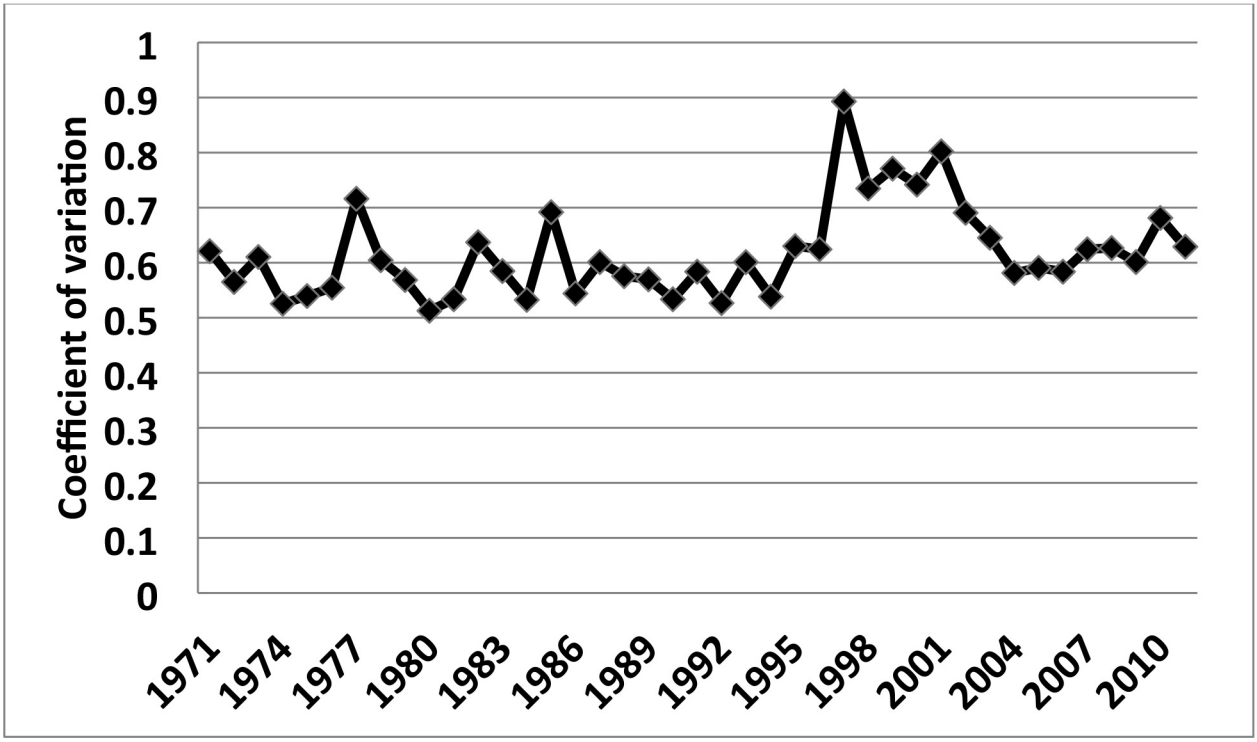
Figure 5. The Standard Deviation for Sales Prices Each Year for Prices from the Kansas Society of Farm Managers and Rural Appraisers



Source: Kansas Society of Farm Managers and Rural Appraisers

http://www.agecon.ksu.edu/ksfmra.

Figure 6. The Coefficient of Variation for Each Year for Land Sales Price Each per Acre from the Kansas Society of Farm Managers and Rural Appraisers



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