Objective Analysis

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Constructing an Organic Price Series: Not as Easy as Expected

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The growth of organic farm production and consumer demand has raised questions regarding the profitability of organic systems. A primary component of this profitability is the size and sustainability of organic price premiums. Additionally, there have been recent large increases in the prices for conventionally-produced commodities due to increases in input costs (particularly fertilizer and fuel), changes in export demand (including the value of the dollar), and also perhaps the ethanol market. We explore the relationships between organic and conventional grain prices over the period 1998 to 2008 using monthly price series. This relatively long period allows us to assess the nature of the price relationships between organic and conventional prices for periods prior to and after the recent run-up in conventional prices. Our focus is on the three key crops for Montana: corn (as a feed barley substitute), hard red spring wheat, and hard red winter wheat.

Obtaining representative organic price series proved to be quite difficult. There was a weekly privately collected price series (Hotline Publishing) from January, 1998 until September, 2006. This data is generally listed as available each week, but the prices do not exhibit very much variation, particularly early in the period. These patterns suggest a thin market. The USDA began monthly reporting of organic prices in February, 2007. Another private set of organic prices is available from the National Farmer's Organization (NFO) beginning October, 2006. Both the USDA and the NFO data are sporadic, with many months of missing observations for wheat. These series' corn prices are complete during the period we consider.

There are additional differences in the three data sets we consider. The Hotline data we assess reports prices for corn, hard red spring wheat (HRS), and hard red winter (HRW) wheat. We consider all of these prices are at the farm level, although they also report these prices at the wholesale level. The NFO data also includes these three crop prices at the farm level. The USDA data reports only corn prices and an all wheat aggregate price, all at the farm level.

Because the availability of the organic series is less than ideal, this paper describes some simple statistical methods that utilize well-reported conventional prices to predict organic prices. The underlying assumption for this effort is that past price relationships between organic (Hotline) and conventional prices should allow projections of organic prices after the Hotline data period. These projections will then be assessed against the new organic price series from the USDA and the NFO. The aforementioned data limitations do not support considerably advanced statistical modeling, but the fairly simple methods used here provide a useful picture into these organic and conventional price relationships.

Methods

Ordinary Least Squares Regression analysis is used to assess the relationships between organic corn, HRS, and HRW with the price of their conventional counterparts for the data from 1998-2006 (Sept). These regressions also included a yearly time trend to account for other factors affecting the relationships between the conventional and the organic prices. We used two measures for the conventional price: the relevant futures price (Chicago Corn, Minneapolis Wheat, Kansas City Wheat) and a weekly USDA cash price for a given location (Fort Dodge, IA for corn; Findley, ND for HRS, and Manhattan, KS for HRW). The regression equations were:

Organic price = $\alpha + \beta$*Conventional Price + γ*Year

The graphs below show the estimation results for organic prices using both the futures price and the conventional cash prices to measure conventional prices. The key estimation results are:

Table 1: Regression Results

Model. Dependent/Cash	α	β	γ	R-squared	N
1. Corn/Futures	-431***	.794***	.228***	.57	98
2. Corn/Conventional Cash	-447***	.496***	.225***	.67	95
3. HRS/Futures	-197***	.077	.101***	.47	97
4. HRS/Conventional Cash	-202***	.046	.104***	.47	97
5. HRW/Futures	-244***	.267***	.124***	.67	98
6. HRW/Conventional Cash	-175***	.302***	.089***	.66	81

*** indicates significance at the 1% level.

Results

Corn, Models 1&2. Estimating the organic corn prices using conventional prices showed a significant relationship (β) between conventional and organic prices in the expected direction. There was a significant and positive year effect (γ), indicating that organic premiums have increased over time (note that time was entered as a four decimal number, so this effect is quite large).

The actual reported organic (dependent variable) and the estimated organic prices from Models 1 and 2 are illustrated in Figure 1. The flat sections of the reported organic prices reflect that these prices changed fairly little over numerous months early in the period. The estimated price lines smooth this effect. Note also that the actual and the estimated price relationships become closer to the actual organic price over time, perhaps reflecting a more developed organic market for corn.

Figure 1: Actual vs. Estimated Organic Corn Prices
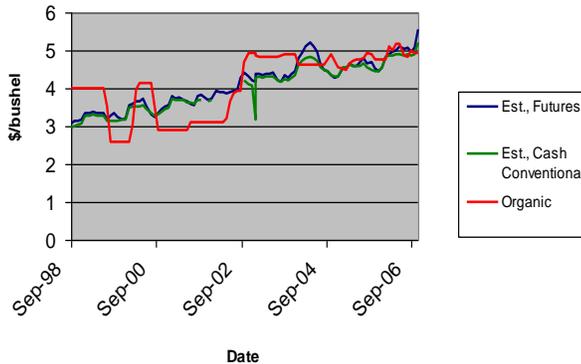
HRS, Models 3&4. The regression results show that the organic HRS prices were not significantly related to the conventional prices during this period. There was as in corn a significant year effect, indicating that the organic price for HRS gained relative to the conventional prices.

The actual organic (dependent variable) and the estimated organic prices from Models 3 and 4 are illustrated in Figure 2. As for corn, there are numerous flat sections early in the period. Again as for corn, the estimated and the actual prices become closer over time.

Figure 2: Organic HRS Prices, 1998-2006
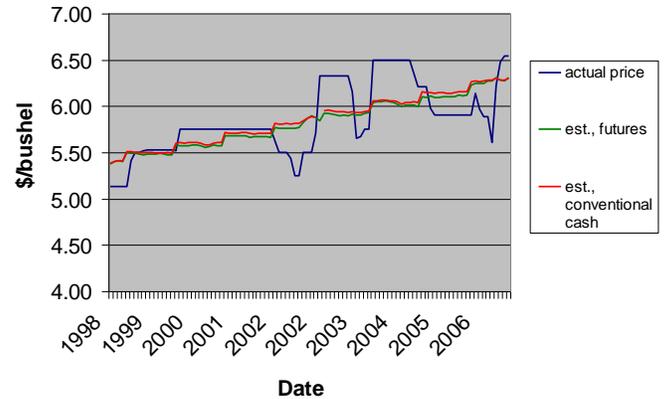
HRW, Models 5 & 6. These regression results indicate a positive and significant relationship between organic and conventional prices. There was also a significant and positive year effect. Model fit as measured by R-squared was the best of all crops.

The actual organic (dependent variable) and the estimated organic prices from Models 5 and 6 are illustrated in Figure 3. As for corn and HRS, the figure exhibits numerous flat areas in the actual organic price early in the period. The actual and the estimated prices become closer over time.

Figure 3: Actual vs. Estimated Organic HRW Prices 1998-2006
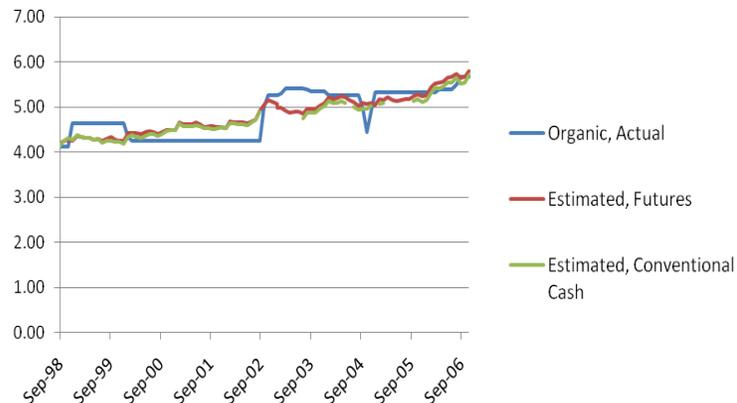
Extension: New Price Series from Oct., 2006 to May, 2008

The regression results discussed above were used to assess the price relationships between actual organic prices from both the USDA and from the NFO with

3

those projected using the models above. We show these results graphically, including the estimated results from both the models using futures markets (1, 3, and 5) and those using conventional cash prices (2, 4, and 6).

Corn. Figures 4 and 5 illustrate the projected and the actual organic prices for corn. Figure 4 illustrates 1998-2006 (Sept), while Figure 5 includes only Oct., 2006 to May, 2008 (the period after the Hotline series). Actual and estimated prices are initially quite close for the period Oct., 2006 until around May, 2007. There is a substantial increase in the actual relative to the estimated organic prices for corn from June, 2007 until sometime around Dec., 2007. This difference is approximately $4 per bushel. Actual organic prices relative to projected prices moderated somewhat after Jan., 2008, but remain at a premium to the predicted prices. It appears that the organic market, or at least these two (USDA and NFO) series, changed relative to the market in the past. The period of this large increase in the actual vs. the projected prices corresponds with the pre-harvest period when organic corn stocks are expected to be lowest in the United States.

Figure 4: Actual vs. Estimated Farm Organic Corn Prices
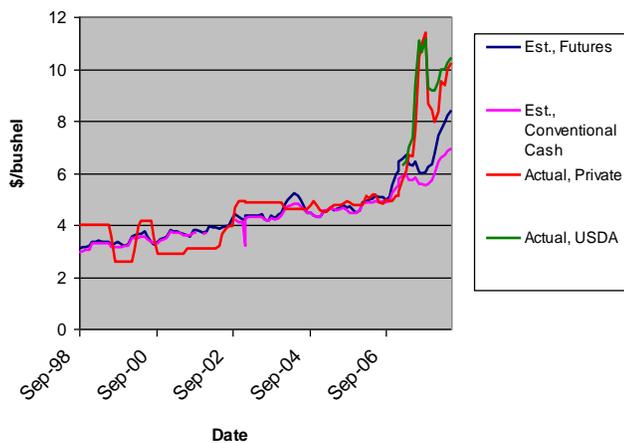
Figure 5: Actual vs. Estimated Farm Organic Corn Prices
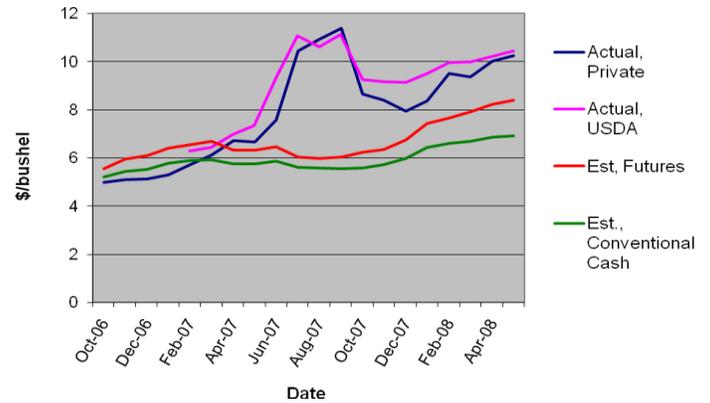
HRS. Figures 6 and 7 illustrate the projected and the actual organic prices for HRS. Figure 6 illustrates 1998-2008 (May), while Figure 7 includes only Oct., 2006 to May, 2008. The thinness of the organic HRS market becomes evident, with many months that are missing price quotes. As for corn, the estimates early and late in the period illustrated in Figure 5 are relatively close. There is again a wide gap between the actual and the projected prices of about $4 to $5, depending on the actual price series used.

Figure 6: Actual vs. Estimated Organic HRS Prices, Oct., 2006-April, 2008

4
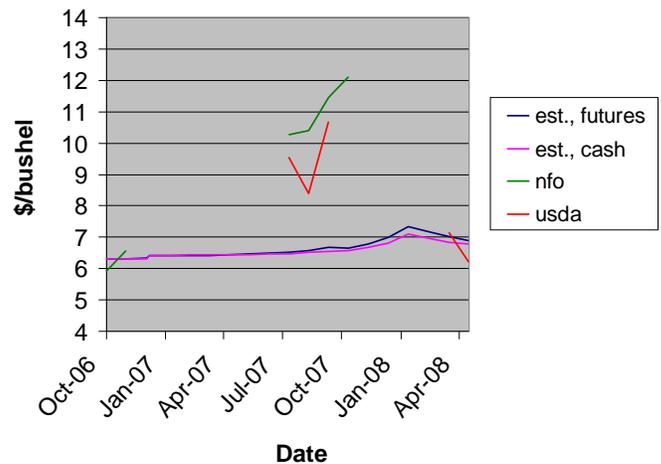
Figure 7: Actual vs. Estimated Organic HRW Prices 1998-2007
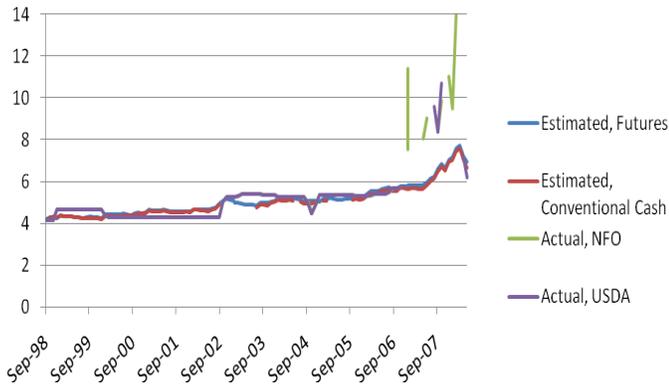
HRW. Figures 8 and 9 illustrate the projected and the actual organic prices for HRW. Figure 8 illustrates 1998-2007 (May), while Figure 9 includes only Oct., 2006 to March, 2008. The HRW market is also thin, with the actual cash prices from the NFO exhibiting quite a bit of discontinuity across months.

Figure 8: Actual vs. Estimated Organic HRW Prices, 1998-2007
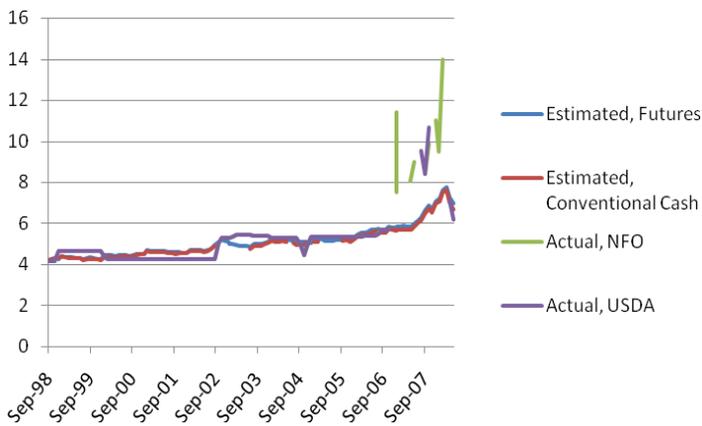
Figure 9: Actual vs. Estimated Organic HRW Prices 2006-2008
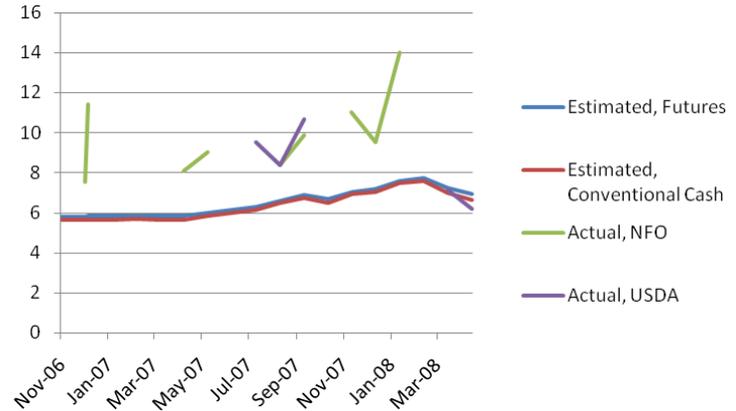
Conclusions

The key finding from this work is that organic markets for major grains remain quite thin. The organic market has generally been thought of as demand-driven, with many instances (including recent years) where ending inventories were very tight and prices were quite volatile. This market thinness places a considerable burden on organic producers' marketing activities, and the price patterns we see clearly indicate how much uncertainty organic producers and processors face.

Secondly, obtaining good public information on organic prices remains difficult for academics and policy makers. This task has become more difficult with some recent differences in the price relationships between organic and conventional grains. In particular, there appears to have been a major divergence between actual and predicted (using conventional prices) organic prices in 2007. This divergence may be moderating.

Given this market thinness, organic producers should develop contacts with multiple buyers in the organic market, and establish long-term relationships with them. These long-term relationships should facilitate price contracts that allow some reduced price variability.

5