

Executive Summary

Daily nearby basis data for 1998–2014 from six regions in Montana were combined with state production and available stocks information to analyze potential deviations in basis values during the first five months of calendar year 2014. Due to numerous, inter-related differences in basis values that naturally occur as a result of unique geographical characteristics, crop production conditions, demand dynamics, and other factors across space and time, a multi-variable regression analysis was used to appropriately account for those aspects and more precisely identify deviations in basis values in early-2014. The results indicate that for hard red winter wheat (11% protein content), basis were \$0.13–\$0.24 per bushel weaker in April and May 2014 than historical basis averages in those months. For hard red spring wheat (13% protein content), basis were \$0.12–\$0.66 per bushel weaker in February through May 2014. These estimates provide suggestive empirical evidence that grain transportation constraints in early-2014 may have adversely affected local cash prices.

Methodology

Basis is an indicator of market conditions, which can be influenced by numerous factors that are inter-related with each other with dynamic complexity. When making inferences using basis data, not accounting for these relationships can lead to incorrect conclusions. A regression model can be used to appropriately represent these dynamics and, therefore, help more accurately identify the impacts of specific changes to grain marketing conditions. The following model is used to explain daily basis behavior at elevators in six regions across Montana (North Central, North Eastern, Great Falls, Golden Triangle, Billings, South Eastern) between 1998 and 2014:

$$\text{basis}_{c,i,d,m,y} = \beta_0 + \beta_1 \text{Production}_{i,y} + \beta_2 \text{Stocks}_{d,m,y} + \beta_3 \text{Location}_i + \beta_4 \text{Year}_y + \beta_5 \text{Month}_{m,y} + \beta_6 (\text{Month} \times \text{Year})_{m,y} + \varepsilon_{c,i,d,m,y}$$

where $\text{basis}_{c,i,d,m,y}$ represents the basis value for wheat of class c in markets within region i on day d , month m , and year y ; Production is the total wheat harvested in the preceding year in region i ; Stocks is the grain stock available in the state; Location is a fixed effect that accounts for factors that are unique to a marketing region and that may impact basis values (relative to other marketing regions), but cannot directly be represented by data (e.g., distance to the Pacific Northwest export market); Year and Month are fixed effects that account for annual and monthly shocks that affect all marketing locations across the state (e.g., seasonality patterns that lead to weaker basis around harvest periods and stronger basis later in the marketing year); (Month \times Year) is an interaction term that identifies deviations in basis values that are unique to a specific year and month combination; and $\varepsilon_{c,i,d,m,y}$ is the regression error term.

The variable of interest is the (Month \times Year) term. The associated marginal effect, β_6 , can be interpreted as the additional difference in basis during a particular year and month, after accounting for other market factors that affect basis values. For example, if β_6 estimates are substantially larger and more negative for the months of January–May 2014, then this provides evidence of changes in the grain marketing landscape that are unique to that period and that led to lower relative basis values. Table 1 shows a description of the data used to estimate the model.

Table 1: Description of Data Used in the Empirical Analysis

Variable	Date Range	Observation Frequency	Geographical Granularity	Source
Nearby Basis, HRWW	01/1998–05/2014	Daily	Regional average	USDA AMS
Nearby Basis, HRSW	01/1998–05/2014	Daily	Regional average	USDA AMS
Wheat production	1997–2013	Yearly	Regional average	USDA NASS
Wheat stocks	12/1997–03/2014	Daily	State average	USDA NASS

Notes: Basis data represent bids for hard red winter wheat (HRWW) with 11% protein content and hard red spring wheat (HRSW) with 13% protein content and are collected by the USDA Agricultural Marketing Service. Wheat stocks data are provided by the USDA National Agricultural Statistical Service and are reported on the first of March, June, September, and December. Linear interpolation with cross-validation was used to estimate daily grain stocks values.

Results and Implications

Table 2 presents the estimated deviations of basis per bushel from the long-run average values for January–May. The estimated results are provided for both hard red winter (HRWW) and hard red spring (HRSW) wheat classes. The “long-run avg basis” column represents the historical average basis for each month, the “2014 basis” column is the estimated basis in 2014, and the “Difference” column is the deviation of the 2014 basis from the long-run averages (positive differences imply a stronger than average basis and negative differences indicate weaker basis). The table presents two scenarios of long-run basis estimates: one for the period 1998–2013 and the second for 2008–2013. Because commodity markets experienced non-trivial changes after 2007, the two sets of results provide evidence of whether deviations from historical averages were consistent across different measures of those averages.

Using the 2008–2013 period, the results show that HRWW basis were \$0.14–\$0.24 per bushel weaker than long-run averages in April and May 2014 and HRSW basis were \$0.12–\$0.66 per bushel weaker between February and May 2014. This provides empirical evidence that non-trivial market shocks occurred during the early-2014 marketing period and that these shocks had adverse impact on the marketing of Montana grain. The weaker basis likely resulted in significant foregone

revenue opportunities for farmers. While there may have been a number of market factors that contributed to the weaker basis and adverse impacts on market returns, it is reasonable to assume that a portion of these outcomes were due to constraints on the transportation infrastructure. This analysis provides a preliminary perspective on the economic impacts of these market events, but further research is necessary to more acutely identify the precise reasons and their financial ramifications.

Table 2: Estimated Basis Values and Differences for the Period of Interest

		Month	Long-run Avg Basis	2014 Basis	Difference
<u>HRWW</u>	1998-2014	January	-\$0.59	-\$0.30	\$0.30
		February	-\$0.55	-\$0.12	\$0.44
		March	-\$0.55	-\$0.65	-\$0.10
		April	-\$0.50	-\$0.90	-\$0.40
		May	-\$0.55	-\$0.87	-\$0.32
	2008-2014	January	-\$0.90	-\$0.30	\$0.61
		February	-\$0.75	-\$0.12	\$0.63
		March	-\$0.72	-\$0.65	\$0.07
		April	-\$0.66	-\$0.90	-\$0.24
		May	-\$0.73	-\$0.87	-\$0.14
<u>HRSW</u>	1998-2014	January	-\$0.41	-\$0.31	\$0.10
		February	-\$0.31	-\$0.38	-\$0.07
		March	-\$0.32	-\$0.91	-\$0.59
		April	-\$0.34	-\$1.14	-\$0.80
		May	-\$0.38	-\$0.96	-\$0.59
	2008-2014	January	-\$0.57	-\$0.31	\$0.25
		February	-\$0.26	-\$0.38	-\$0.12
		March	-\$0.30	-\$0.91	-\$0.61
		April	-\$0.48	-\$1.14	-\$0.66
		May	-\$0.60	-\$0.96	-\$0.36