BACK TO THE BASICS: WHAT DOES THE MARKET TELL US ABOUT BASIS?

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Back to the Basics: What Does The Market Tells Us About Basis?

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Abstract

This study explores market forces that affect harvest grain basis for corn, soybeans, and wheat in a grain deficit market. The findings indicate that implied basis (cash forward bid less harvest futures), nearby HHO price, and log of open interest on the harvest futures contract can be used to predict 33 to 99 percent of the variation in harvest basis at selected South Carolina locations.

Motivation

Most of the previous grain basis research has primarily focused on the major grain producing regions of the United States. These studies have utilized models based on the cost of storage in explaining and forecasting grain basis (e.g. Jiang and Hayenga, 2004; Hauser, Garcia, and Tumblin, 1990; Siaplay, Anderson, and Brorsen, 2007). Utilizing the theory of storage in basis behavior and forecasting models is applicable to markets where production exceeds use. This is not the case for South Carolina, where use outweighs production and there is very little available storage. Thus, previous research provides little guidance for basis forecasting in grain deficit markets such as South Carolina.

The ability to predict which basis is prevalent when the hedge is lifted is critical for effective use of futures markets for managing price risk.

Focusing on publically available information for a basis forecasting model will make it more suitable for use by grain producers.

Objective

The goal of this study is to develop a harvest grain basis forecasting model that includes factors that affect basis in a grain deficit markets, and can be used by producers to effectively manage their pre-harvest price risk.

Methods

Previous research papers have used historical average and current information to help predict basis (e.g. Dhuyvetter and Kastens,1998; Hauser, Gracia and Tumblin, 1990; Zhang and Houston, 2005; Taylor, Dhuyvetter, and Kastens, 2004; and Hatchett, Brorsen, and Anderson, 2009). These studies utilized some form of current information to reflect fluctuations in basis over time. In this study, we utilize the current information that is forward looking, i.e., the local cash forward contract bid less the harvest futures price. This relationship was defined for this study as the "implied basis". The implied basis allows one to view current information as a snapshot of how the current market conditions view future market conditions. It was hypothesized that the strong implied basis at the initiation of a hedge would translate to a strong harvest basis.

In accordance with the law of one price ,the transportation cost is hypothesized to be the driving component of basis in a grain deficit market. The cost of transportation is measured in this study by the price of a nearby NYMEX Home Heating Oil (HHO) futures contract as most methods of transportation used for grain shipping in the state use diesel fuel. It was hypothesized that increases in transportation cost will cause the grain basis to weaken because as costs rise, the difference between cash and futures (basis) should become larger; in other words, the level of the cash price relative to the futures will become lower or "weaker."

The determination of grain basis is driven by market forces at both the local and national level. The national market contributes to the formation of the harvest basis through futures price. In addition to futures price of the harvest contract as part of the implied basis as described above, this study investigated whether changes in the size of the futures market measured as log of the open interest of the harvest futures contract affect basis. It was hypothesized that the larger size of the futures market may drive futures prices away from the signals relevant to the cash market, thus weakening the basis.

Annual Model Results

Table 1. Harvest Grain Basis Forecasting Model for Selected South Carolina Locations, 2001-2008 Marketing Years.

Commodity	Corn		Soybean		Wheat	
Statistic\ Location	Hamer	Monetta	Estill	Kershaw	Columbia	Hamer
Intercept	0.450 ***	0.010	0.365 ***	-0.201	0.412	-1.085 ***
Implied Basis	0.013	0.675 ***	0.304 ***	0.312 ***	0.251 ***	0.580 ***
Nearby HHO	-0.077 ***	-0.074	-0.012	-0.037 **	-0.316 ***	-0.458 ***
Log Open Interest	-0.079 **	0.024	-0.058 **	0.062	-0.028	0.295 ***
R-squared	0.897	0.333	0.391	0.391	0.812	0.909
Adjusted R-squared	0.893	0.304	0.377	0.380	0.808	0.907
Number of observations	89	72	133	177	155	158

Notes: Implied basis is a weekly average forward contract price less harvest futures (December for corn, November for Soybeans, and July for Wheat) price in $/bu, Nearby HO is a weekly average price of the nearby home heating oil contract on NYMEX in cents/gallon, and Log Open Interest is the natural logarithm of the weekly average open interest for the harvest futures contract for the respective commodity measured by open contracts. Dependent variable is the harvest time (average of weeks 41-44 for corn, 40-43 for soybeans, and 21-24 (FY 2005 Columbia weeks 25-28) for wheat, basis for the respective commodity in $/bu. One asterisk (*) denotes significance at the 10% level, two asterisks (**) denote significance at the 5% level, three asterisks (***) denote significance at the 1% level.

Planning Horizon Results

Table 2. Planning Horizon (Early -First Three Months , Late - Last Two/Three Months of Planning Period) Annual Harvest Grain Basis Forecasting Model for Selected South Carolina Locations, 2001-2008 Marketing Years.

	Commodity	Corn		Soybean		Wheat	
	Statistic\ Location	Hamer	Monetta	Estill	Kershaw	Columbia	Hamer
Early Planning Horizon	Intercept	0.454 ***	0.226	0.632 ***	0.076	1.630 ***	-1.500 ***
	Implied Basis	0.005	0.770 ***	0.108 *	0.592 ***	0.170 **	0.705 ***
	Nearby HHO	-0.077 ***	-0.041	-0.003	-0.014	-0.334 ***	-0.571 ***
	Log Open Interest	-0.080 ***	-0.027	-0.112 **	0.001	-0.300 ***	0.434 ***
	R-squared	0.898	0.361	0.263	0.558	0.831	0.909
	Adjusted R-squared	0.895	0.329	0.228	0.542	0.825	0.905
	Number of observations	87	64	67	90	92	94
Late Planning Horizon	Intercept	na	na	0.200	-0.433	0.204	-0.130
	Implied Basis	na	na	0.605 ***	0.247 ***	0.265 ***	0.692 ***
	Nearby HHO	na	na	0.020	-0.033	-0.270 ***	-0.202 ***
	Log Open Interest	na	na	-0.038	0.105	0.008	0.042
	R-squared	na	na	0.715	0.320	0.836	0.983
	Adjusted R-squared	na	na	0.702	0.296	0.828	0.983
	Number of observations	na	na	66	87	63	64

Notes: Implied basis is a weekly average forward contract price less harvest futures (December for corn, November for Soybeans, and July for Wheat) price for the respective planning horizon, Nearby HHO is a weekly average price (cents per gallon) of the nearby home heating oil contract on NYMEX for the respective planning horizon, and Log Open Interest is the natural logarithm of the weekly average open interest for the harvest futures contract for the respective commodity(December for corn, November for soybeans, and July for Wheat)for the respective planning horizon. Dependent variable is the harvest time (average of weeks 41-44 for corn, 40-43 for soybeans, and 21-24 (FY 2005 Columbia weeks 25-28) for wheat, basis for the respective commodity for the respective planning horizon. One asterisk (*) denotes significance at the 10% level, two asterisks (**) denote significance at the 5% level, three asterisks (***) denote significance at the 1% level.

Methods (*Continued*)

The Harvest Basis model estimated in this study is:

$$HB_k^T = IB_k^t + HHO_k + LogOI_k^T$$

where HB_k^T is harvest basis calculated as the difference between cash and nearby futures prices during harvest window (weeks 41-44 for corn; weeks 40-43 for soybeans; and weeks 21-24 for wheat), IB_k^t is implied basis calculated as the difference between cash forward for harvest delivery price and harvest futures price, HHO is a nearby HHO price, and LogOI is the log of open interest for the harvest futures contract for a each commodity, T = Harvest Contract, t = Harvest window, and k = hedge initiation time.

The analysis was conducted for two locations for each commodity, most locations are characterized as processor except Hamer wheat, which is an elevator. The planning horizon for the hedge was assumed to be six months prior to harvest. Changes in factors that affect basis were also examined for the early planning horizon consisted of the first three months of the planning period and the late planning horizon which consisted of the last three months of the planning period.

Results

The proposed model explained from 33 to 91 percent of the variation in harvest grain basis at selected SC locations.

The coefficient of the implied basis had an expected sign and was statistically significant at all but one location. The magnitude of the coefficient ranged from 0.251 dollars/bushel at Columbia, to 0.675 dollars/bushel at Monetta. Thus, for every dollar/bushel rise in the implied basis, the harvest basis becomes stronger by 0.674 dollars/bushel at Monetta.

The nearby HHO coefficient had an expected sign and was statically significant at four out of six locations. The magnitude of the coefficient ranged from -0.037 cents/gallon at Kershaw to -0.458 cents/gallon at Hamer – wheat. This means that for every one cent/gallon rise in the nearby HHO contract, the harvest basis will become more negative and weaken by 0.077 dollars/bushel at Hamer.

The log of the open interest was statistically significant in the model for three out of six locations. The magnitude of the coefficient ranged from -0.079 % at Hamer – corn to 0.295% for Hamer – wheat. Therefore, a one percent change in the log of the open interest will translate to the harvest basis becoming weaker by 0.079 dollars/bushel at Hamer corn but 0.295 dollars/bushel stronger for Hamer wheat.

Due to the lack of cash forward price data, no inferences were made about the factors for predicting harvest basis during the late planning horizon. Implied basis was an important predictor of harvest basis both in early and late planning horizons for soybeans and wheat. The magnitude of the coefficients varied between the early and late planning horizon but without a general pattern. The impact of HHO price was significant at both wheat locations and slightly stronger during the early planning horizon, while it became insignificant for both soybean locations. The impact of the size of the futures market through the log Open Interest variable concentrated in the early planning horizon and became insignificant within three months to contract expiration.

Conclusions

The findings of this study indicate that grain producers in South Carolina can get strong signals about upcoming harvest basis from comparing cash forward bids to prices of the harvest futures contracts. These signals can be further refined by including the information on the price of the nearby HHO contract as well as the open interest of the harvest futures contracts. While the implied basis was a strong predictor throughout the planning horizon, the impact of HHO and open interest weakened in the later planning periods. These three sources of information that are easily obtainable by the general public represent the forces that affect basis in the grain deficit market and can be used by grain producers in South Carolina to better manage their pre-harvest price risk.

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