The Cost of Forward Contract in CIF NOLA and Mississippi River System Barge Freight Markets

Bradley Isbell, Graduate Research Assistant in the Department of Agricultural Economics and Agricultural Business at the University of Arkansas, bjisbell@uark.edu, and Andy M. McKenzie, Professor in the Department of Agricultural Economics and Agricultural Business at the University of Arkansas, mckenzie@uark.edu and B. Wade Brorsen, Regents Professor and A.J. and Susan Jacques Chair in the Department of Agricultural Economics at Oklahoma State University, wade.brorsen@okstate.edu.

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Bradley J. Isbell[1], Andy M. McKenzie[2], and B. Wade Brorsen[3]

(1) Graduate Research Assistant and (2)Professor, University of Arkansas in the Department of Agricultural Economics and Agricultural Business at the University of Arkansas and (3) Regents Professor and A.J. and Susan Jacques Chair in the Department of Agricultural Economics at Oklahoma State University.

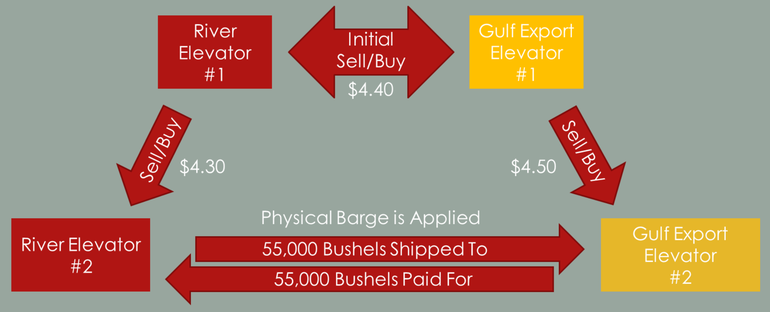
ABSTRACT

Price risk management in the grain industry is typically accomplished through the use of forward contracts and futures contract hedging. An additional important price discovery and risk management "paper market" also exists in the form of CIF NOLA basis bids, traded through brokers . These bids are similar in function to traditional forward contracts, however, like a futures market, firms can offset their forward contractual obligations by offsetting positions in a liquid off-exchange paper market. Analysis shows that this liquidity may remove the pricing bias commonly found in forward contracting in corn and soybeans, although a small bias might still exist in wheat and sorghum. To deliver on these contracts, firms must book barge freight to deliver the grain, and the use of forward contracts as a means of transportation price risk management is explored to determine any potential costs, as well as costs based on seasonality. Results conclude that while forward contracting provides lower freight rates during the summer season, the harvest and storage season features forward prices consistently higher than subsequent spot prices at the time of delivery.

BACKGROUND

- River elevators mitigate price risk by forward contracting the sale of grain in the gulf export market. These contracts specify a barge (55,000bu) of grain be delivered CIF NOLA (cost, insurance, freight to New Orleans).
- These contracts differ from traditional forward contracts, however, in that they can be re-traded multiple times before maturity. This unique dynamic is similar to a futures contract, which suggests risk premia, commonly associated with forward contracts, might not be a feature of this market.
- River elevators can also forward contract for the barge freight required to deliver on CIF NOLA contracts. These contracts allow a river elevator to lock in a freight price up to 3 months ahead of a shipping date by accepting posted offers.
- Unlike a traditional agricultural forward contract, barge freight forward contracts are offers made by the seller of an input/service (transportation) which are accepted by the buyer (river elevator). Therefore, the barge freight forward market characteristics might also differ from a traditional agriculture forward contracting market.

CIF NOLA MARKET EXAMPLE



	River Elevator #1	Gulf Export Elevator #1	River Elevator #2	Gulf Export Elevator #2
Buy	$4.30	$4.40		$4.50
Sell	$4.40	$4.50	$4.30	
Receipts	$242,000	$247,500	$236,500	
(Payments)	($236,500)	($242,000)		($247,500)
Net Profit (loss)	$5,500	$5,500	$236,500	($247,500)

DATA AND METHODS

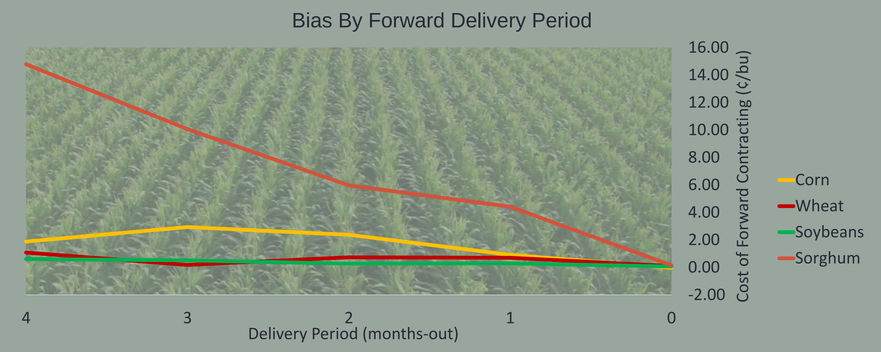
- For analysis of CIF NOLA bids,
  - Dataset contained daily bids for corn, soybeans, wheat, and sorghum for up to 4 months out delivery. Bids are given in terms of basis in relation to corresponding Chicago Board of Trade futures contract (sorghum is traded as a corn contract).
  - The mean of first differences between daily bids is found to determine the average daily bias in forward bids, representing a risk premium. The following is used to find the total cost of forward contracting 4 months out:
  - *Bias over life of contract = (estimate$_1$ * 20) + (estimate$_2$ * 20) + (estimate$_3$ * 20) +(estimate$_4$ * 20).*
- For barge freight offers,
  - Dataset contained weekly forward offers for 1 and 3 month out delivery periods for the following locations: Twin Cities, Mid-Mississippi, Lower Illinois River, St. Louis, Cincinnati, Lower Ohio River, Cairo-Memphis, and Memphis-South.
  - Offers are given in terms of percent of tariff. The tariff referenced is the 1976 benchmark tariff rate for the corresponding location on the Mississippi River System.
  - $Log\ First\ Differences = Log\ Rate_t^{l,d} - Log\ Rate_{t-1}^{l,d}$
  - First differences of the natural log of levels is taken, then the mean of the first differences is found and exponentiated to return it to original terms. The total cost of forward contracting is then found according to the following:
  - $Total\ Cost\ of\ Forward\ Contracting^{l,3} = \left(Average\ Change\ in\ Percent\ of\ Tariff^{l,3} * 4\right) + Rollover^{l,3,1} + \left(Average\ Change\ in\ Percent\ of\ Tariff^{l,1} * 4\right) + Rollover^{l,1,0}$.

RESULTS

- CIF NOLA model:
  - Costs of forward contracting are not significant for either corn or soybeans, although significant forward contracting costs do exist for both wheat and sorghum of 1.08¢/bu and 14.78¢/cwt, respectively, for forward contracting four months out. Although the estimate for wheat is significant, sorghum is the only commodity with substantial and significant costs of forward contracting. Consistent with similar studies, the estimates for costs of forward contracting follow the trend of increasing as the length of the contract increases.
  - Volume data for grain exported from the port of New Orleans helps to explain this difference in forward contracting costs among different commodities. In 2016 corn, soybeans, and wheat accounted for about 98% (68.2 million metric tons) of total grain exports, while sorghum accounted for just 0.4% of grain exports (261,784 metric tons).
- Barge freight model:
  - A negative number represents a cost to the river elevator (buyer), while a positive cost represents a cost to the barge line (seller)
  - The Twin Cities location shows positive costs for all three seasons, with costs of $9.22, $979.86, and $390.50 for seasons 1, 2, and 3, respectively.
  - Beyond the Twin Cities location, the results all follow the pattern of having a cost to the barge line for forward contracting during the summer season (season 2), and a cost of forward contracting to the river elevators during the harvest and winter season (seasons 1 and 3).

RESULTS

Commodity	Average Daily Bias	Bias over life of contract (¢/bu)	Student's T Test Statistic	Student's T Test P-Value	Sign Test Statistic	Sign Test P-Value	Signed Rank Test Statistic	Signed Rank Test P-Value
Corn	-0.053	1.88	-0.46	0.6449	10.5	0.4324	772.5	0.8686
Soybeans	0.005	0.61	0.05	0.9600	20.5	0.1112	4925.5	0.2801
Wheat	0.045	1.08	0.52	0.6056	30	0.0093	5949	0.0777
Sorghum	0.236	14.78	1.24	0.2162	18	0.0032	1239	0.0105



	Season	ACOFC ($/ton)	$/barge corn		Season	ACOFC ($/ton)	$/barge corn
Twin Cities	1	$ 0.01	$ 9.2158	Cincinnati	1	$ (0.46)	$ (705.7483)
	2	$ 0.64	$ 979.8630		2	$ 0.30	$ 466.8941
	3	$ 0.25	$ 390.4953		3	$ (0.27)	$ (412.5590)
Mid-Mississippi River	1	$ (0.32)	$ (485.3367)	Lower Ohio River	1	$ (0.44)	$ (670.7239)
	2	$ 0.44	$ 679.2808		2	$ 0.29	$ 443.8215
	3	$ (0.31)	$ (475.1212)		3	$ (0.25)	$ (392.3807)
Lower Illinois River	1	$ (0.31)	$ (484.0433)	Cairo-Memphis	1	$ (0.06)	$ (87.0950)
	2	$ 0.33	$ 511.2228		2	$ 0.20	$ 313.9562
	3	$ (0.23)	$ (353.4512)		3	$ (0.18)	$ (273.7876)
St. Louis	1	$ (0.45)	$ (697.3920)	Memphis-South	1	$ (0.06)	$ (87.0604)
	2	$ 0.30	$ 460.3373		2	$ 0.27	$ 409.0182
	3	$ (0.26)	$ (404.7419)		3	$ (0.18)	$ (273.3917)

CONCLUSIONS

- CIF NOLA forward contracts are traded before maturity in a process similar to futures contract.
- This trading and retrading of contracts works to remove costs of forward contracting typically associated with forward contracting in corn, soybeans, and wheat, which are traded in high volumes in the market.
- Costs of forward contracting in the barge freight market are highly seasonal.
- Firms can reduce costs on average by accepting forward bids for barge freight in season 2 relative to purchasing freight in the spot market.
- During seasons 1 and 3 when volume is highest on the river, barge lines (sellers) seem to be extracting a risk premium for the service of taking on price risk from river elevators in the form of consistently higher forward offers in relation to the subsequent spot prices for barge freight.
- Firms involved in the Mississippi River System grain market have unique price risk management tools that differ in characteristics from traditional risk management tools for agricultural commodities.