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## The Importance of Basis In Grain Marketing Decisions

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February 1986

Study Paper # 86-1

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GRAIN MARKETING DECISIONS

By

Craig L. Israelsen  
and  
Donald L. Snyder

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                 ...

## THE IMPORTANCE OF BASIS IN GRAIN MARKETING DECISIONS

by

Craig L. Israelsen and  
Donald L. Snyder\*

The main purpose of futures markets is to facilitate the trading of contracts which allow producers, processors and merchandisers of commodities to minimize their exposure to the risk of adverse price fluctuation. This is achieved by either buying or selling contracts for delivery of a specified amount of a given commodity at a future date. These particular players in the futures markets are referred to as "hedgers" since they are offsetting a cash position by either buying or selling futures contracts.

The other player necessary for market liquidity is the "speculator". This participant in the futures market, as could be inferred by the name, seeks to earn money simply by buying low and selling high or vice versa. The speculator seldom, if ever, has a cash position in the commodity in which they are trading futures contracts. The intent of this paper will be to examine the price relationship, and therefore the hedging opportunities, between the cash and futures markets for wheat and barley from the perspective of the hedger (specifically the producer).

### BASIS

Critical to the performance of a hedge in the futures market is the difference between the local cash price and the futures price. This price difference is the basis. Basis can be shown by the following example

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\* The authors are, respectively, Research Associate and Associate Professor, Dept. of Economics, Utah State University.

February:

Ogden wheat producer sells CBT Sept. wheat futures @ \$3.75

Current Ogden cash market price @ \$3.85

Beginning basis = Cash price - futures price

$$\$3.85 - \$3.75 = \$.10$$

August:

Wheat producer buys back CBT Sept. wheat futures @ \$3.62

Sells wheat at current Ogden cash market price @ \$3.59

$$\text{Ending basis: } \$3.59 - \$3.62 = \text{\$-.03}$$

Beginning basis - ending basis = profit/loss

$$\$0.10 - (\text{\$-.03}) = \$.13 \text{ profit}$$

In this example the producer watched the cash price of wheat drop \$0.26, from \$3.85 in February to \$3.59 in August. The September contract futures price went from \$3.75 to \$3.62, a decline of \$0.13. Without hedging the producer receives \$3.59 per bushel. With the hedge he receives \$3.59 in the cash market, as before, plus \$.13 from the favorable basis, for a total of \$3.72 per bushel (minus some additional costs to be discussed later). As can be seen from the example the hedge did not in reality lock in the February price, but substantially improved the price received in August.

Simply put, the basis is the difference in price received in a local market and the price received in a major terminal market, like Chicago or Kansas City. Several factors can account for the price difference, namely:

- 1) The cost of transportation from the local market to the terminal market;
- 2) Different supply and demand conditions between the two markets (local and terminal);



- 3) Differences in the type of grain (variety, protein level, moisture content, etc.);
- 4) Different storage costs between the two markets.

The factors affecting the basis will be present whether a producer hedges or not. However, should a hedge be placed and futures contracts sold, the following costs need to be considered.

Brokerage Fees. There will be a fee associated with buying or selling futures contracts through a qualified broker.

Interest. Buying or selling futures requires a deposit of money equal to roughly 10% of the value of the contract. This deposit is known as margin. Should the market move against ones position, more margin money would be required. Since money will be tied up in the margin, an interest cost should be included.

To actually deliver on a futures contract would involve additional costs.

Delivery Point Discount. Should a producer deliver on a futures contract (which very seldom happens) to a point other than "par" delivery point he would be assessed a discount.

Delivery Costs. Delivery of the grain, whether at a par point or not, will be made to an elevator which will charge for elevation and storage.

Transportation. Any additional costs of transporting and handling the grain should also be included.

#### CASH AND FUTURES MARKET PRICE CORRELATION

The concept of basis trading, or hedging, is related directly to the correlation between the cash and futures price. If the cash price goes down, the futures price should also go down if the two markets are correlated. Theoretically a long position in the cash market can be "protected" by having a short position in the futures market. A loss sustained in the cash market can potentially be offset by buying back futures contracts at a lower price than at which they were sold. The reliability of the hedge is dependant upon the estimated basis movement and the degree of

correlation between the two markets. Without an estimate of the ending basis the optimal time to begin the hedge, by selling futures contracts, would be impossible to calculate.

Assuming that past market performance is to some degree predictive of the future the hedger can use information gleaned from historical data as a decision making tool. The degree of correlation between cash and futures market prices in the past, or how closely they follow each other over time, effects the level of confidence in the interpretive quality of the data.

For the wheat farmer who seeks price protection by hedging his wheat crop there are four futures contracts to choose from: Soft red wheat (SRW) the Chicago Board of Trade (CBT), hard red wheat (HRW) at the Kansas City Board of Trade (KBT), dark northern spring wheat (DNS) and soft white wheat (SWW) at the Minneapolis Grain Exchange (MGE). A barley farmer may hedge his barley (BLY) crop using the barley contract at the Winnipeg (WPG). Attempting to match wheat types is not as critical as identifying price correlation between the futures and cash market since a very small fraction of the outstanding futures contracts are delivered upon.

All important to the success of a hedge is when to place it and when to lift, or cancel, it. Tracking the price movements of the cash and futures markets provides data relative to the optimal timing of a hedge. A common method of tracking both cash and futures is to plot the basis (current cash price - current futures price). Table 1 shows the weekly basis for Ogden grains during the period from July 1981 - November 1984. For all the basis calculations the Wednesday cash price and futures price were used. This paper examines only the Chicago soft red wheat (CBT-SRW), Kansas City hard red wheat (KBT-HRW) and Winnipeg barley (WPG-BLY) futures prices in conjunction with the Ogden cash price for wheat and barley.

Table 1. Descriptive statistics for the Ogden/Futures Basis, 1981-84.

	Max.	Min.	Mean	Standard Deviation
Ogden 10% HRW - CBT SRW	.6925	-.70	-.061	.277
Ogden 13% HRS - CBT SRW	.9375	-.35	.4925	.245
Ogden White - CBT SRW	1.19	-.61	.087	.388
Ogden 10% HRW - KC HRW	.245	-.93	-.328	.221
Ogden 13% HRS - KC HRW	.755	-.44	.225	.245
Ogden White - KC HRW	.59	-.90	-.181	.320
Ogden BLY - WPG BLY	.88	-1.97	-.540	.530

Condensing basis data from a number of years into averages provides a useful tool in analyzing hedging possibilities. Figures 1-7 show the weekly basis (Wednesday cash price minus Wednesday futures price) over of four year period from 1981-84, while in figures 8-14 the four years of weekly basis data are condensed into an **average** weekly basis during the calendar year. These latter graphs are referred to as the average weekly basis.

Figures 15 and 16 show the and average yearly basis and standard deviation for the Ogden cash/futures market basis, i.e. what is average difference in price between the cash and futures markets over a year's time and how much does that average fluctuate. Intuitively, the more fluctuation in the basis the more risky the hedge.

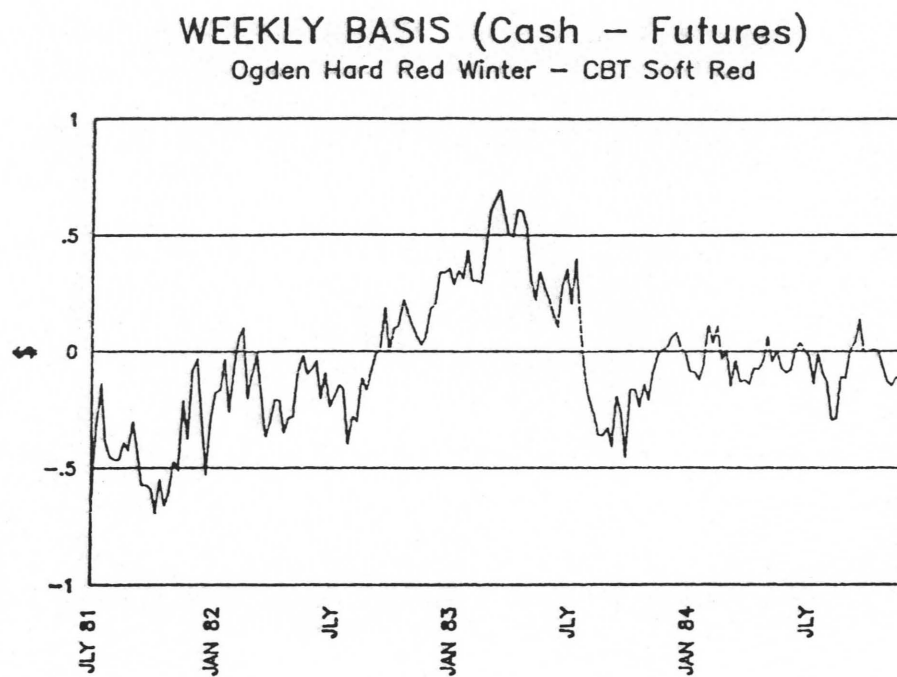


Figure 1. Ogden HRW - CBT SRW weekly basis, 1981-84.

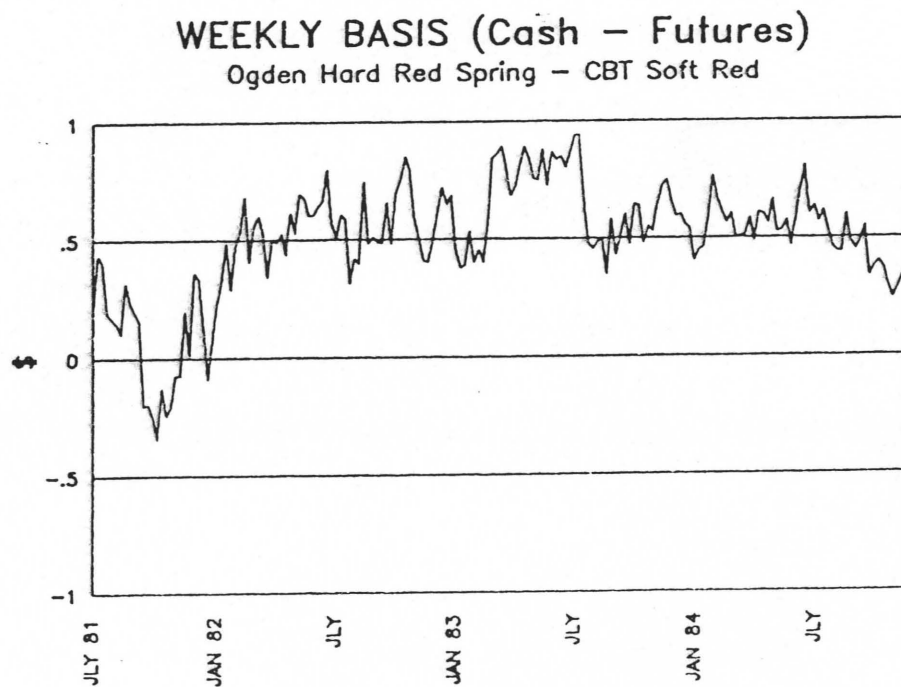


Figure 2. Ogden HRS - CBT SRW weekly basis, 1981-84.

### WEEKLY BASIS (Cash - Futures)

Ogden White - CBT Soft Red

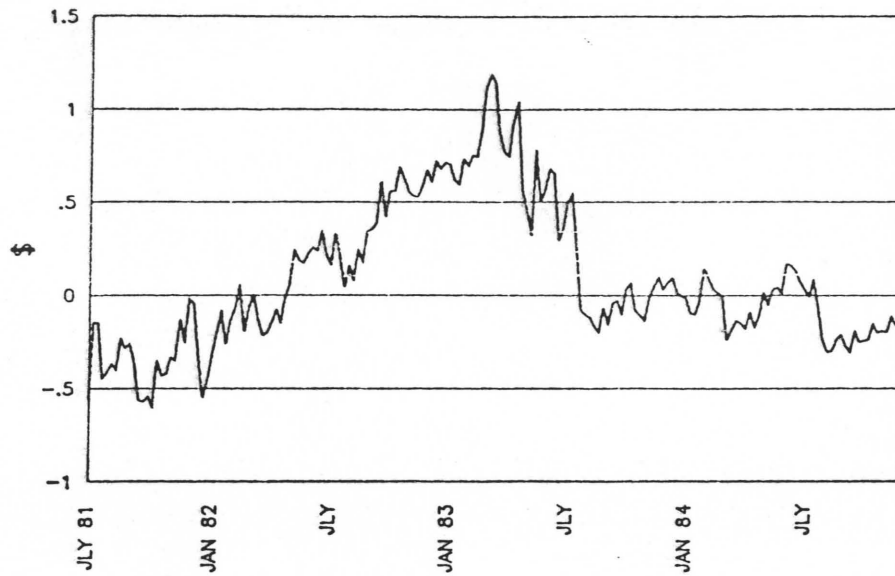


Figure 3. Ogden White - CBT SRW weekly basis, 1981-84.

### WEEKLY BASIS (Cash - Futures)

Ogden Hard Red Winter - KC Hard Red

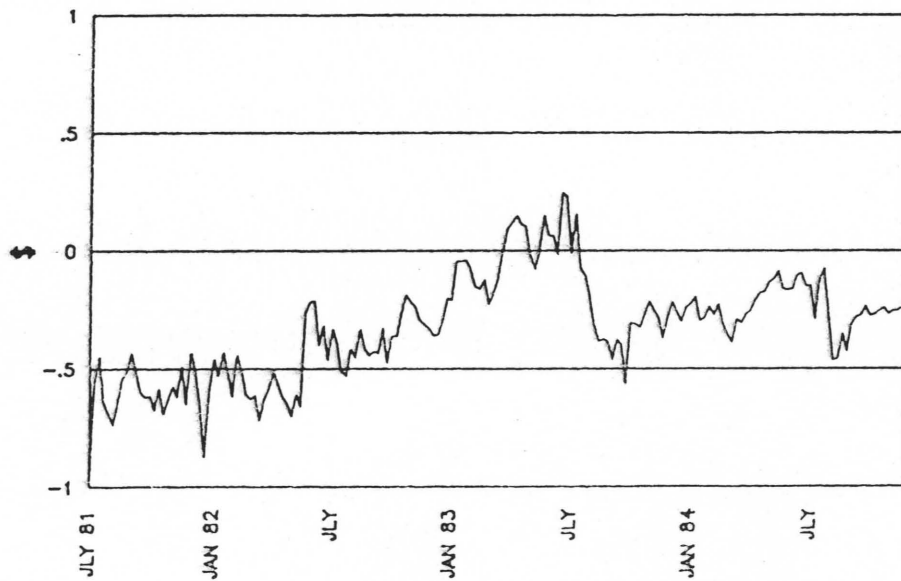


Figure 4. Ogden HRS - KC HRW weekly basis, 1981-84.

WEEKLY BASIS (Cash - Futures)  
Ogden Hard Red Spring - KC Hard Red

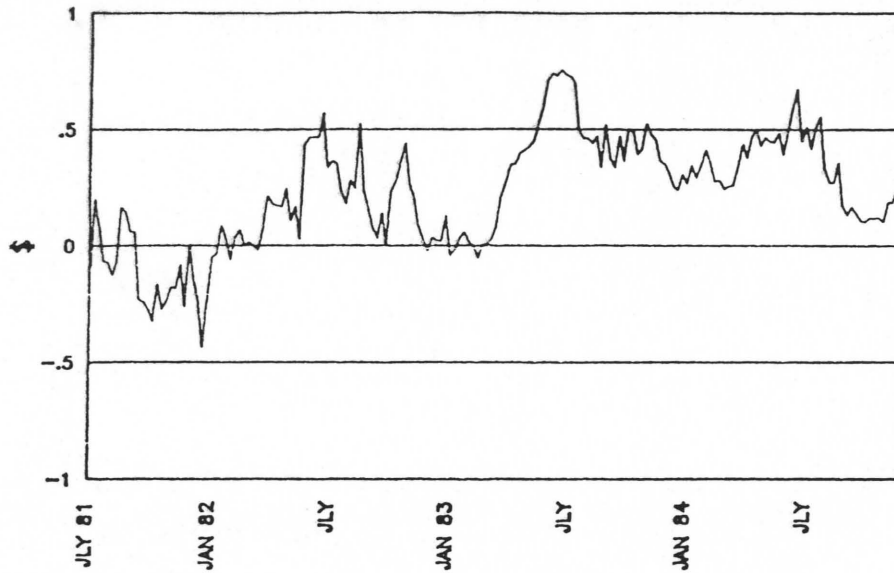


Figure 5. Ogden HRS - KC HRW weekly basis, 1981-84.

WEEKLY BASIS (Cash - Futures)  
Ogden White - KC Hard Red

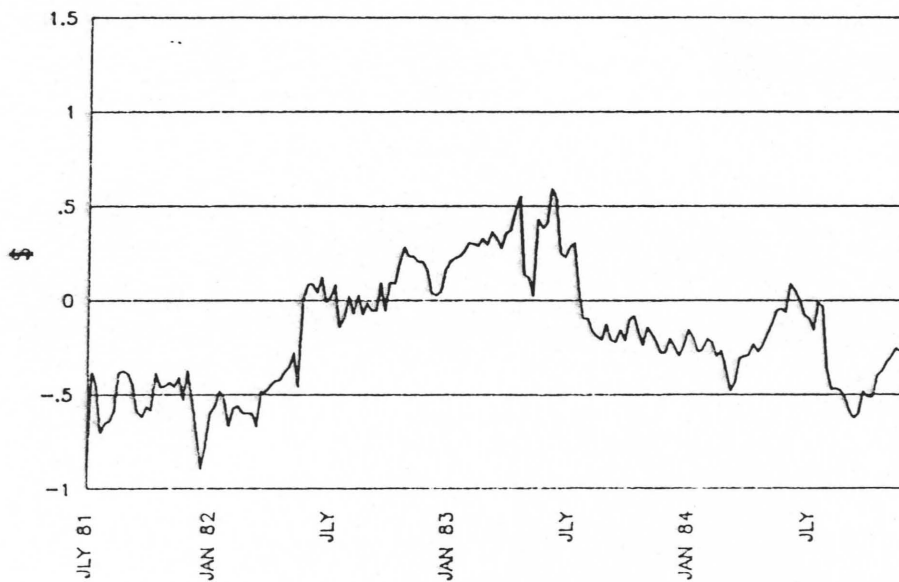


Figure 6. Ogden White - KC HRW weekly basis, 1981-84.

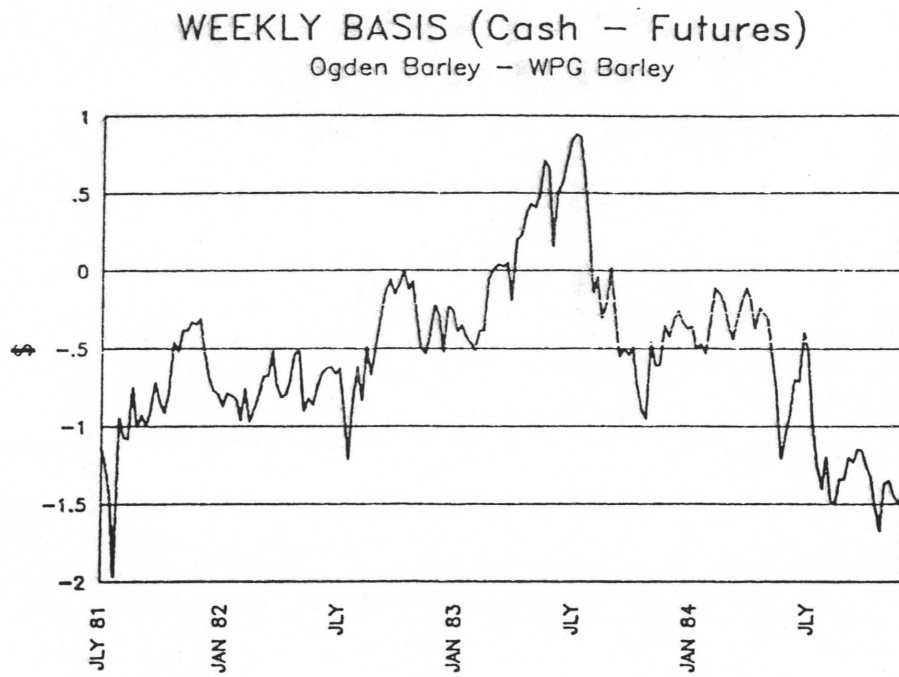


Figure 7. Ogden Barley - Winnipeg Barley weekly basis, 1981-84.

# AVERAGE WEEKLY BASIS

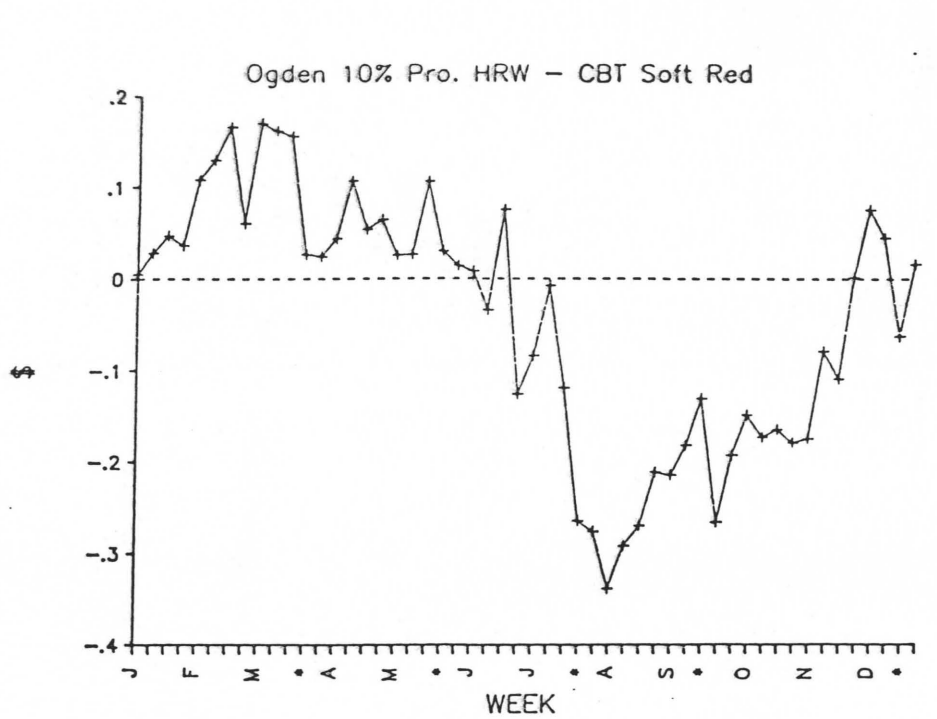


Figure 8. Ogden HRW - CBT SRW average weekly basis, 1981-84.

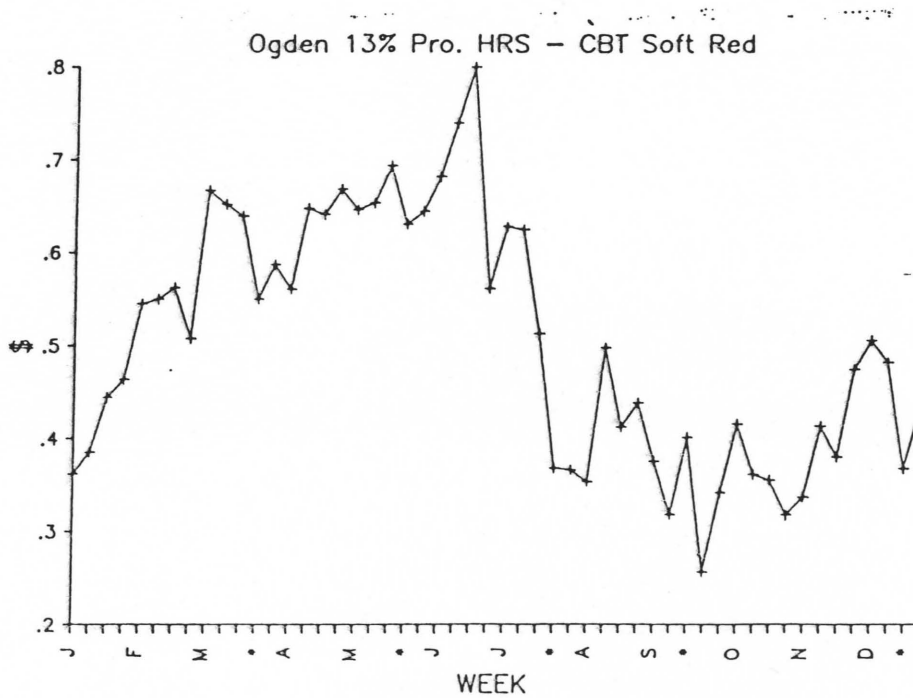


Figure 9. Ogden HRS - CBT SRW average weekly basis, 1981-84.



# AVERAGE WEEKLY BASIS

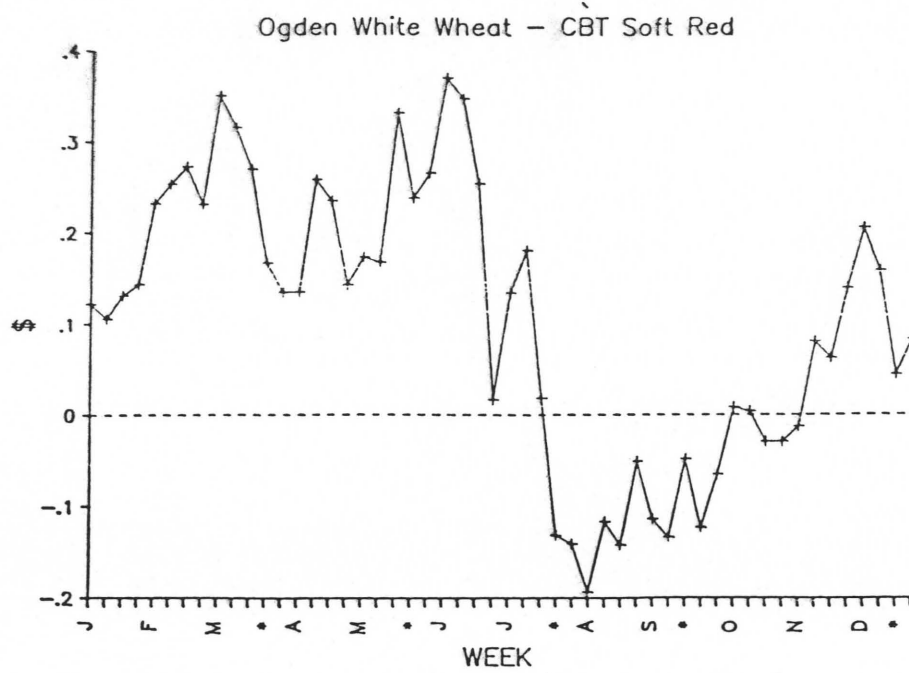


Figure 10. Ogden White - CBT SRW average weekly basis, 1981-84.

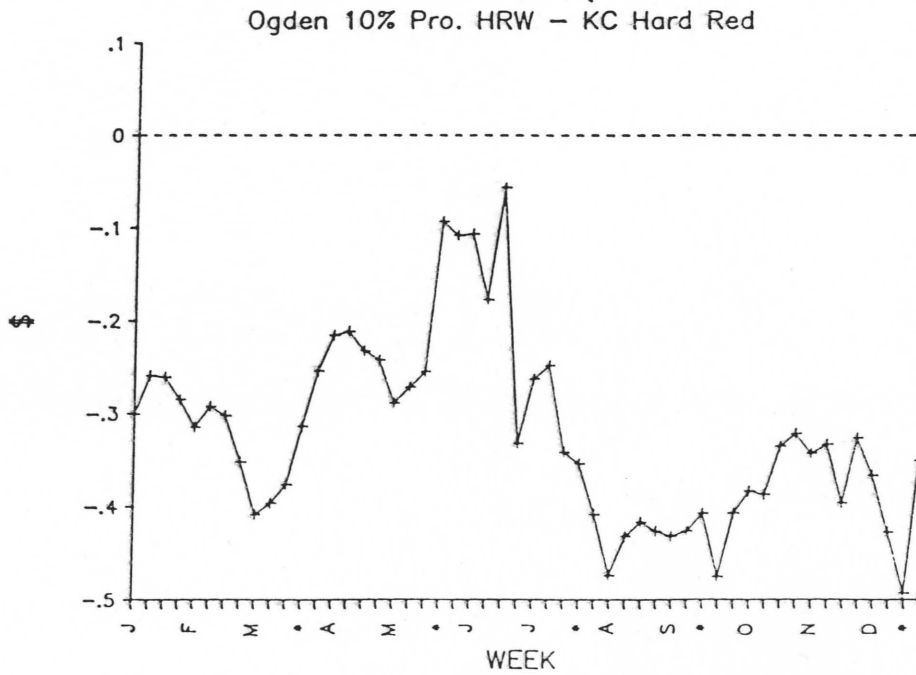


Figure 11. Ogden HRW - KC HRW average weekly basis, 1981-84.

# AVERAGE WEEKLY BASIS

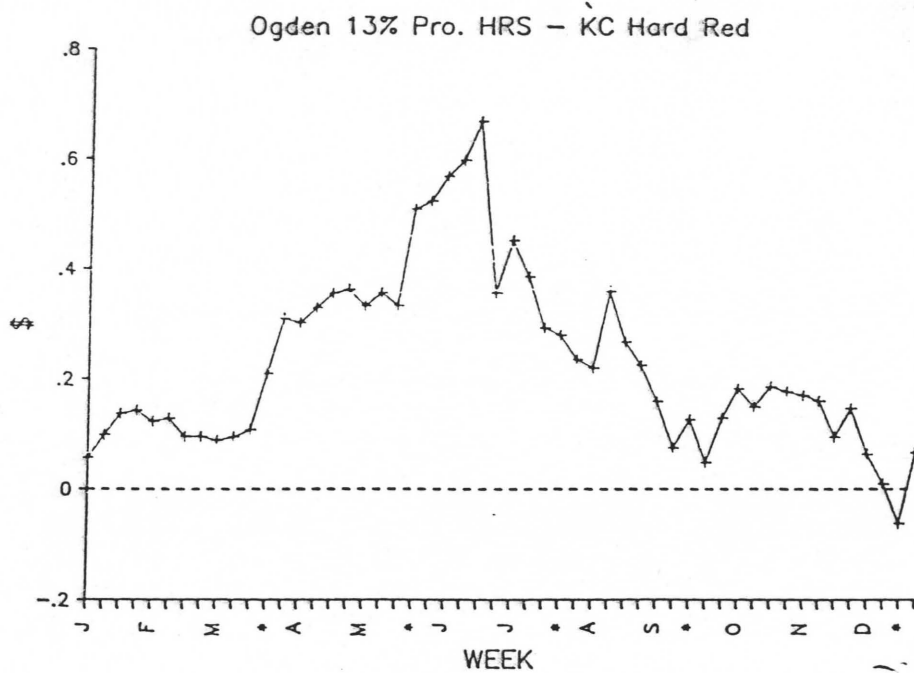


Figure 12. Ogden HRS - KC HRW average weekly basis, 1981-84.

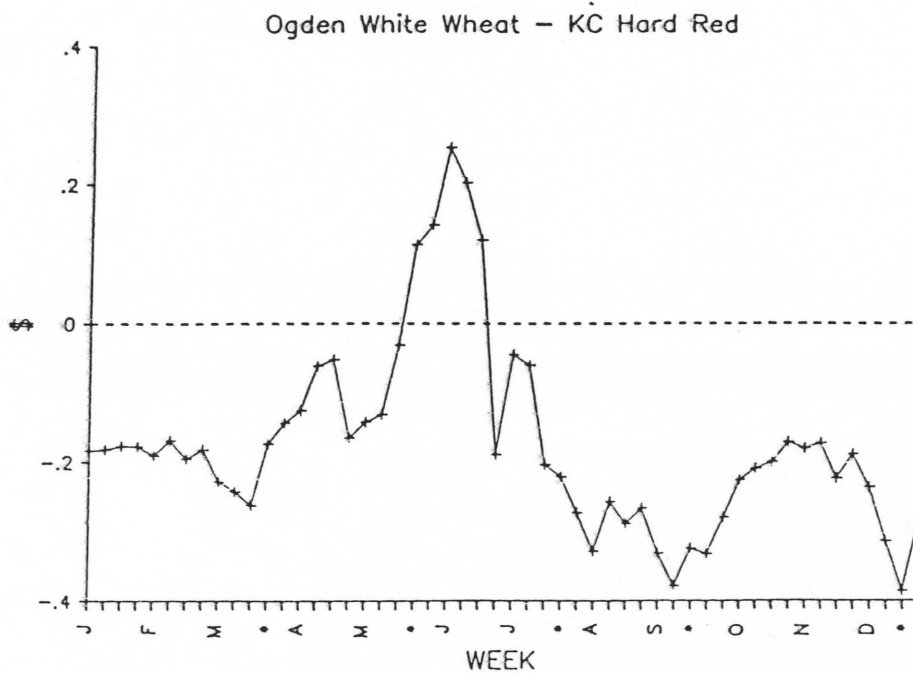


Figure 13. Ogden White - KC HRW average weekly basis, 1981-84.

# AVERAGE WEEKLY BASIS

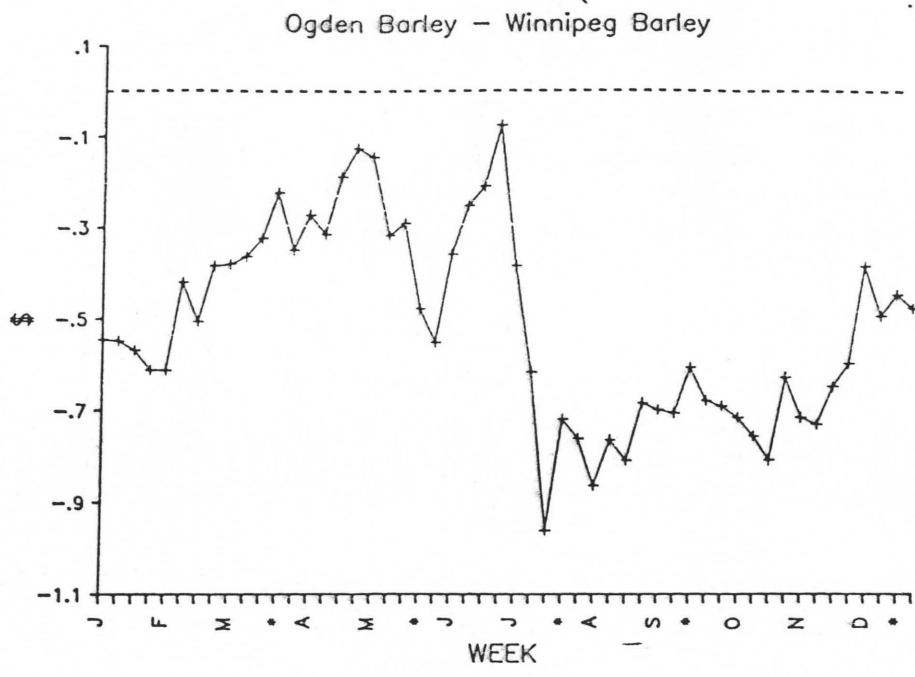


Figure 14. Ogden Barley - Winnipeg Barley average weekly basis, 1981-84.

### AVERAGE YEARLY BASIS

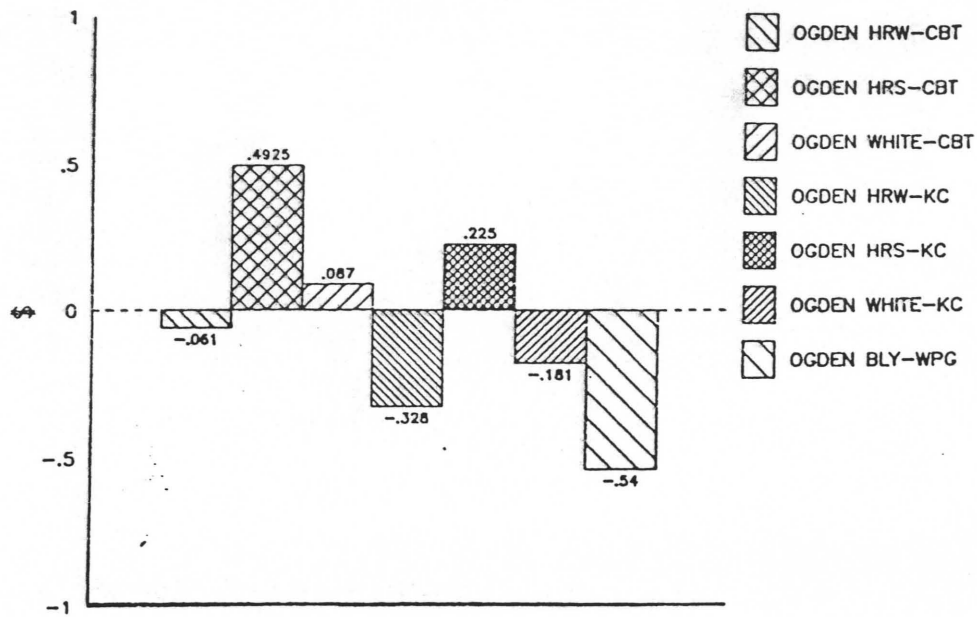


Figure 15. Ogden - Futures market average yearly basis, 1981-84 data.

### BASIS STANDARD DEVIATION

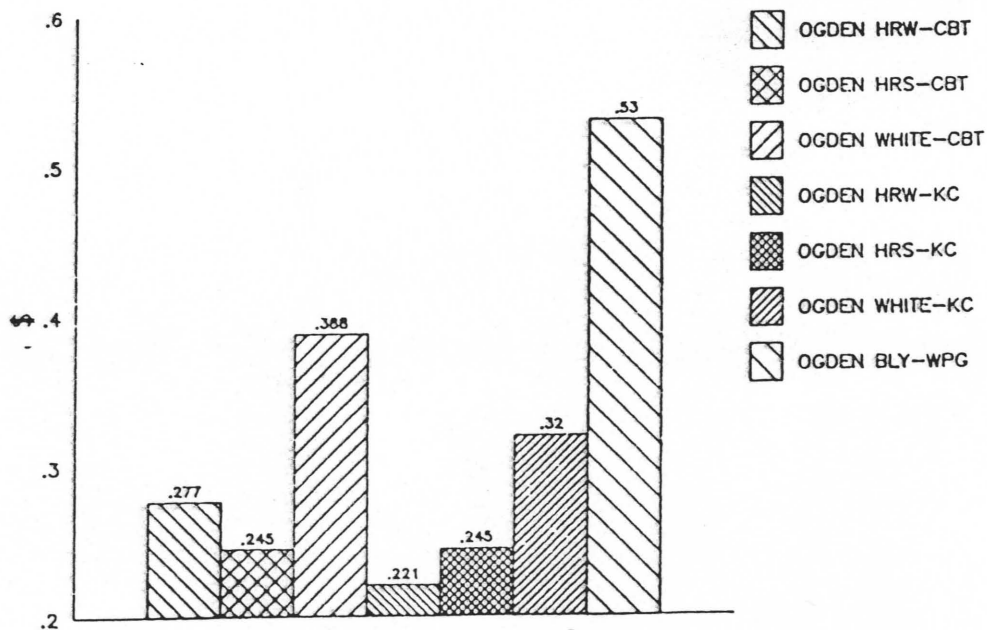


Figure 16. Ogden - Futures market average yearly basis standard deviation, 1981-84 data.

Having seen the basis movement, our next concern is market (or price), correlation. Table 2 shows the linear equations derived by least-sum regression and the corresponding  $R^2$  between the cash and futures markets.

Table 2. Linear Regression Equation and Corresponding Degree of Correlation ( $R^2$ ) on Basis Data, 1981-84.

Y	X	Equation of 95% Confidence Level	$R^2$
Ogden HRW	CBT SRW	$Y = 2.595 + .2579X$	.1276
Ogden HRS	CBT SRW	$Y = 2.997 + .300 X$	.231
Ogden White	CBT SRW	$Y = 3.659 + .0019X$	.000
Ogden HRW	KC HRW	$Y = 1.909 + .418 X$	.247
Ogden HRS	KC HRW	$Y = 3.187 + .230 X$	.099
Ogden White	KC HRW	$Y = 2.695 + .252 X$	.048
Ogden BLY	WPG BLY	$Y = 2.603 + .479 X$	.449

The  $R^2$  for the Ogden soft white and CBT soft red correlation increases dramatically when only recent (Aug 83 - Nov 84) price data are regressed, yielding an  $R^2$  of .480. This improvement in the price correlation, however, does not negate the lack of correlation over a longer period. With  $R^2$  values so low can it be inferred that Ogden prices are not based on the futures market? Table 3 shows the price correlation data between the Ogden & Portland spot cash markets.

Table 3.

<u>Y</u>	<u>X</u>	<u>Equation</u>	<u>R<sup>2</sup></u>
Ogden HRW (10%)	Ptld HRW (10%)	$Y = .447 + .726 X$	.554
Ogden HRS (13%)	Ptld HRS (13%)	$Y = 1.01 + .662 X$	.564
Ogden White	Ptld White	$Y = -.089 + .912 X$	.835
Ogden Bly	Ptld Barley	$Y = .953 + .808 X$	.691

The correlation of prices between the Ogden, Utah and Portland, Oregon markets is significantly higher than between the Ogden and the CBT, KC and WPG futures markets.

#### Summary

An opportunity to hedge Utah wheat/barley in one of the major futures markets (CBT, KC, WPG) certainly exists. The average weekly basis pattern (Figs. 8-14) provides a guideline as to when the hedge should be placed and lifted. The 1981-84 price correlation between Ogden cash prices and futures market prices is however, quite weak. Without stronger correlation the risks of adverse basis movement may outweigh the potential gain in hedging.

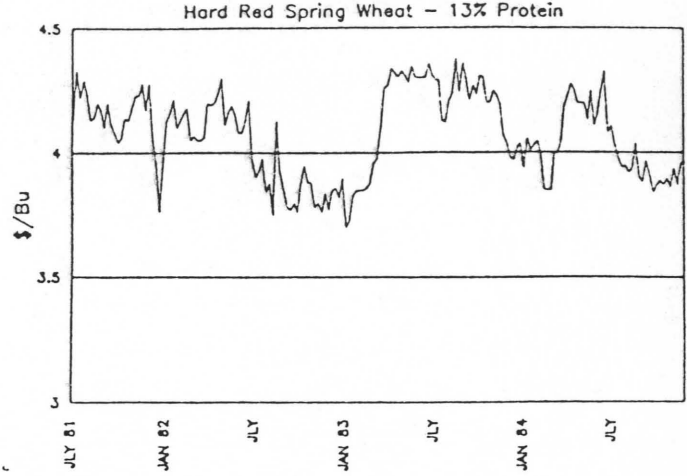
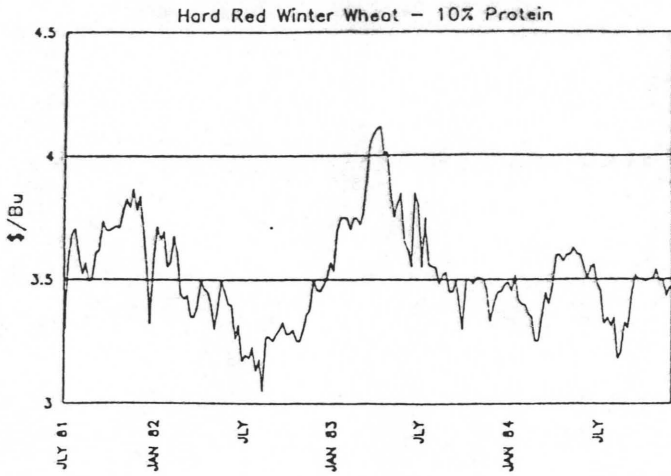
The price correlation between Ogden and Portland cash markets is significantly higher than correlation between Ogden cash prices and futures markets, suggesting that the effect of overlapping regional markets (Ogden - Portland) has a greater impact on price than the futures markets.

Using deferred cash price bids from the Portland grain market may provide more reliable estimates of nearby (next one to two months) Ogden cash prices than futures market prices.

APPENDIX

WEDNESDAY OGDEN PRICES - JULY 81-NOV 84

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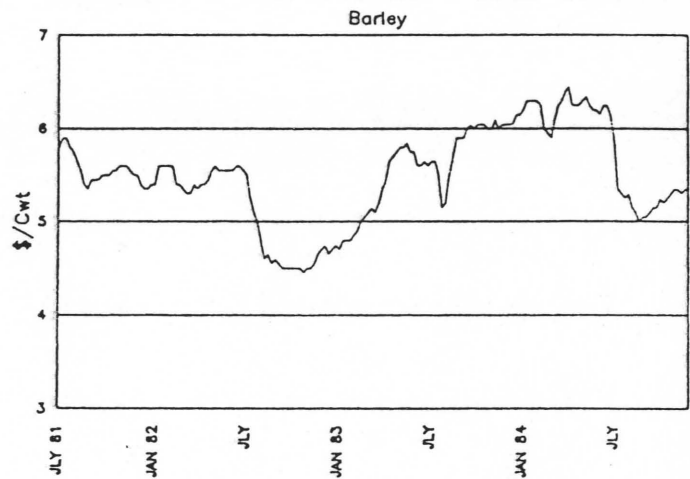
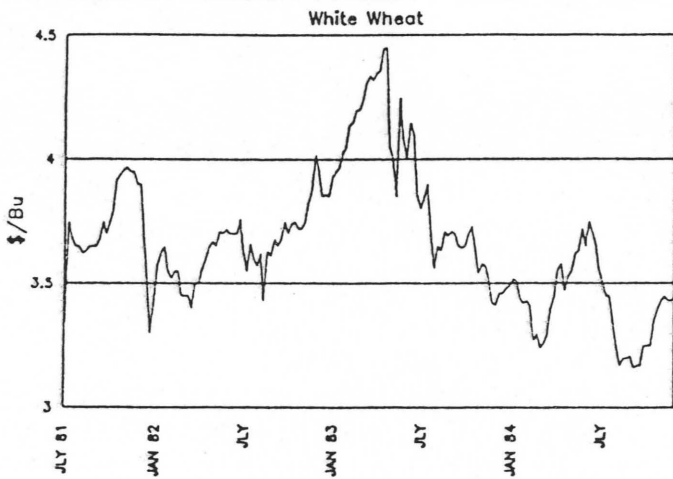
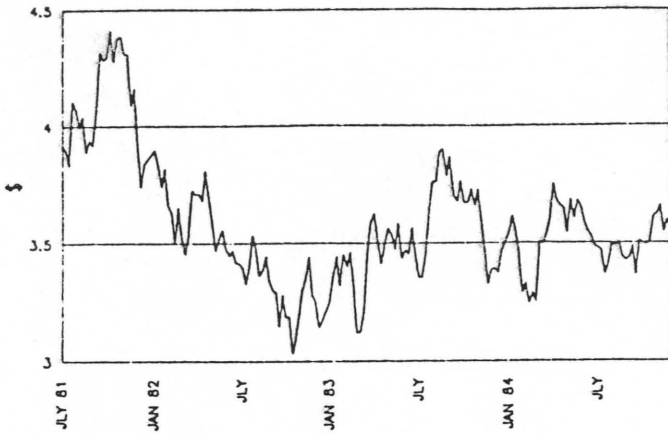


Table 4. Descriptive Statistics of Ogden Weekly Wednesday Cash Prices for 10% Pro. HRW, 13% Pro. HRS., White Wheat and Barley, 1981-1984.

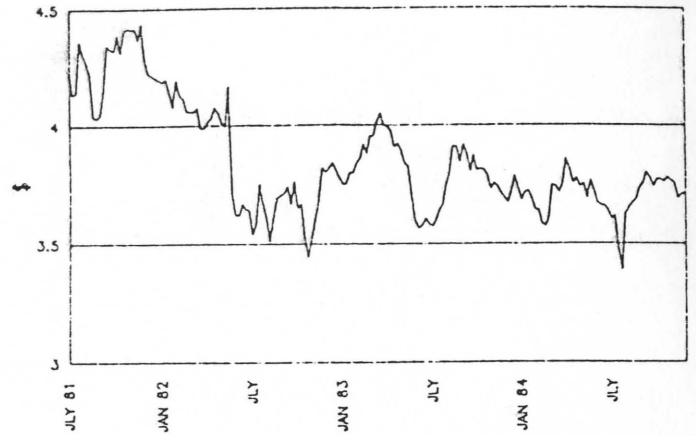
	Max	Min	Ave	Standard Deviation
HRW	4.12	3.05	3.52	.199
HRS	4.38	3.70	4.07	.172
White	4.45	3.16	3.67	.273
Bly/cwt	6.45	4.45	5.49	.51



WEEKLY FUTURES PRICES - July 81-Nov 84  
CBT Soft Red Wheat



WEEKLY FUTURES PRICES - July 81-Nov 84  
KC Hard Red Wheat



WEEKLY FUTURES PRICES - July 81-Nov 84  
WPG Barley

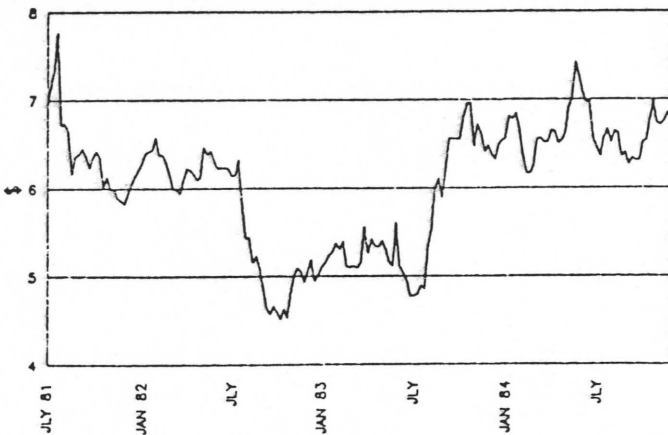


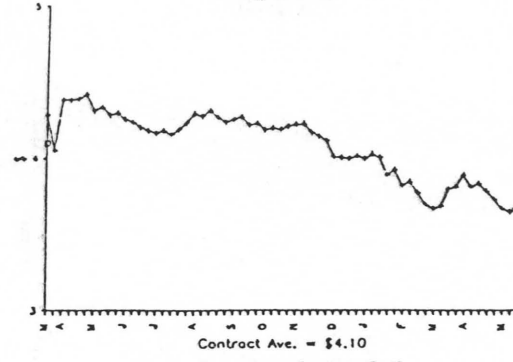
Table 5. Descriptive Statistics of Weekly Futures prices for CBT soft red, KC hard red wheat and WPG barley, 1981-1984. (CBT and KC in \$/bu, WPG in \$/cwt).

	Max.	Min.	Mean	Standard Deviation
1981-1984 CBT Weekly	4.41	3.03	3.58	.276
KC	4.43 1/2	3.38 1/2	3.85	.237
WPG	7.77	4.50	6.04	.712

CBT SOFT RED WHEAT  
March Contract



CBT SOFT RED WHEAT  
May Contract



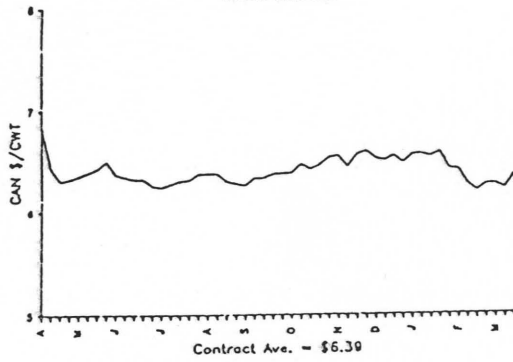
CBT SOFT RED WHEAT  
July Contract



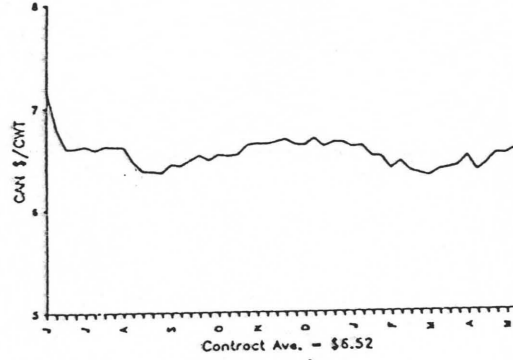
CBT SOFT RED WHEAT  
September Contract



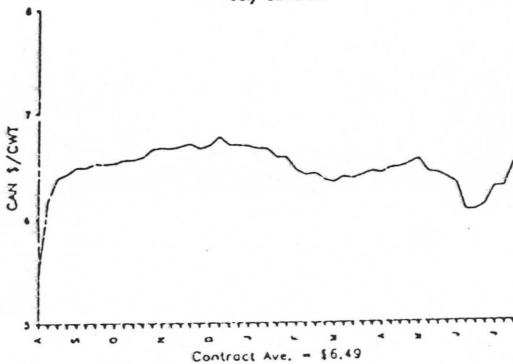
WPG BARLEY  
March Contract



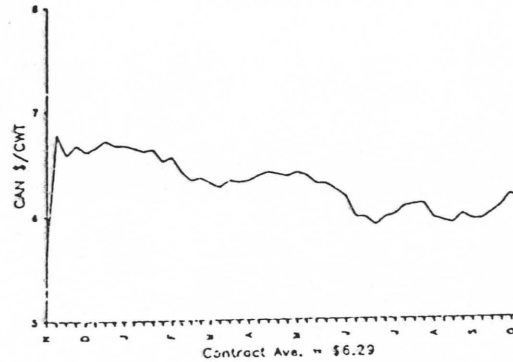
WPG BARLEY  
May Contract



WPG BARLEY  
July Contract



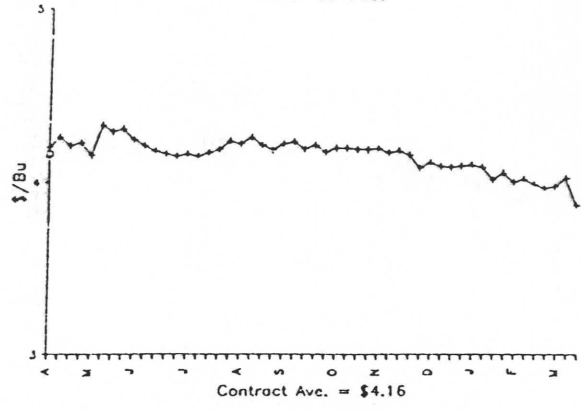
WPG BARLEY  
October Contract



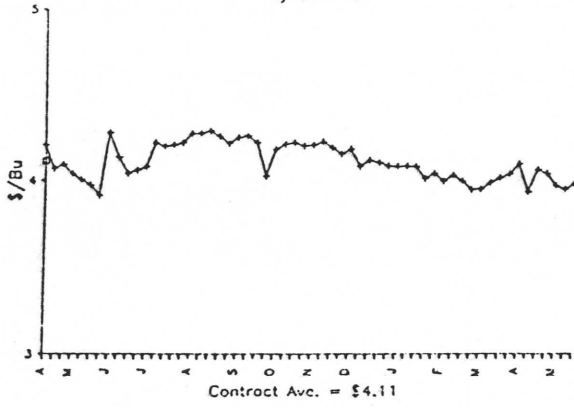
CBT SOFT RED WHEAT  
December Contract



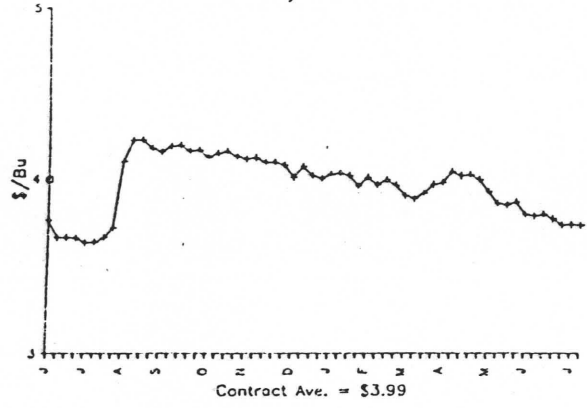
KC HARD RED WHEAT  
March Contract



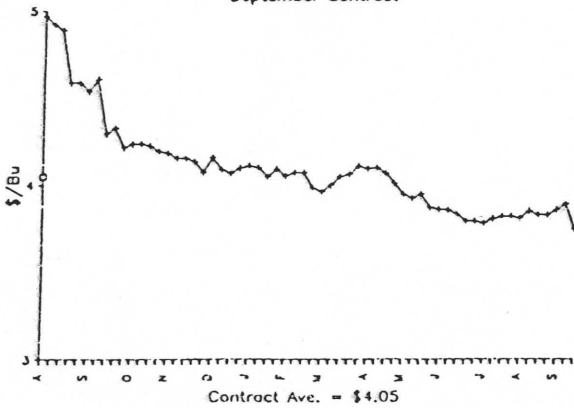
KC HARD RED WHEAT  
May Contract



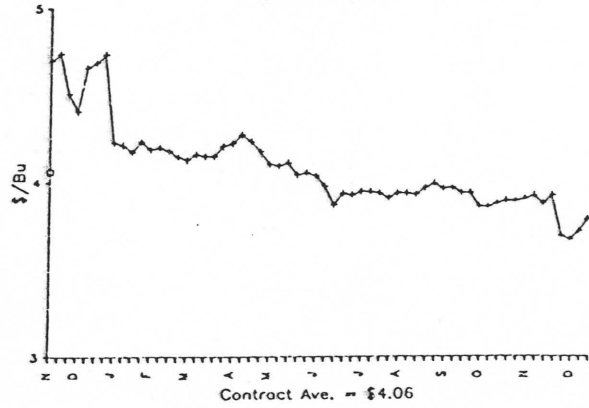
KC HARD RED WHEAT  
July Contract



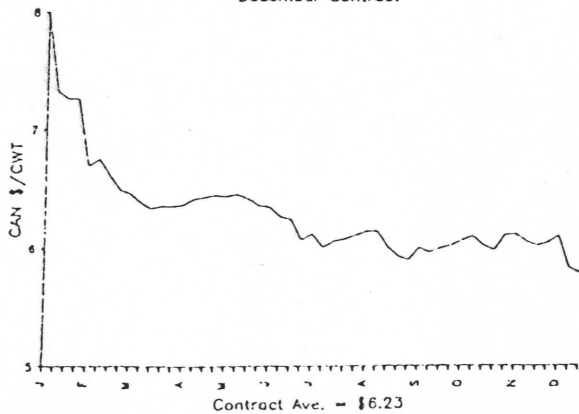
KC HARD RED WHEAT  
September Contract



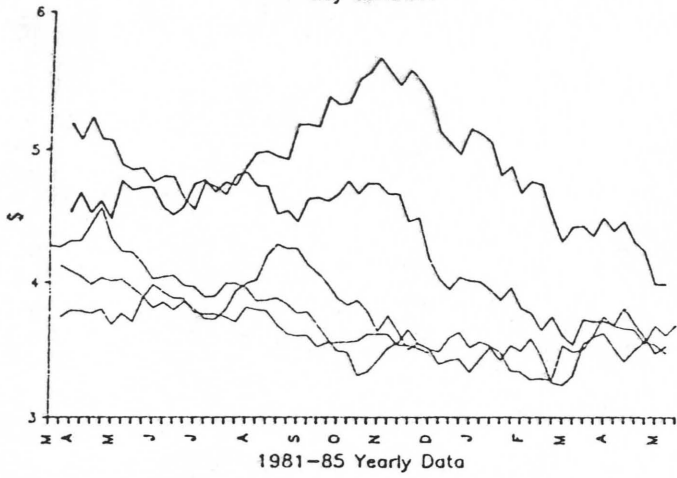
KC HARD RED WHEAT  
December Contract



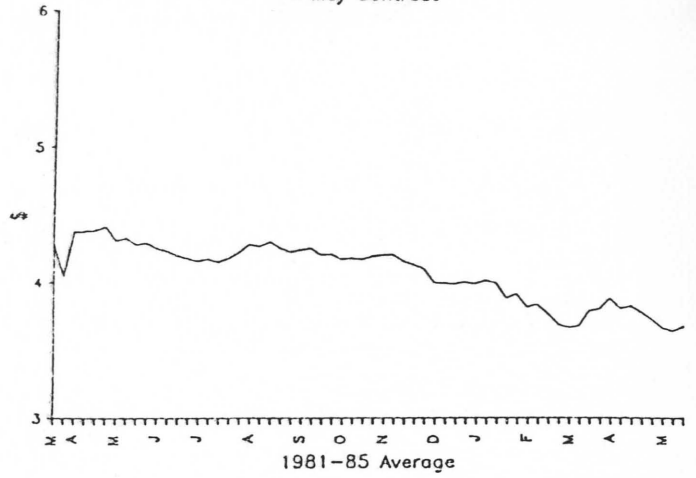
WPG BARLEY  
December Contract



CBT SOFT RED WHEAT  
May Contract



CBT SOFT RED WHEAT  
May Contract



1981-84 Data (Yearly)

CBI

	<u>Max</u>	<u>Min</u>	<u>Mean</u>	<u>Standard Deviation</u>
Mar	5.62	3.11 3/4	4.14	.593
May	5.65 1/2	3.23 1/2	4.10	.581
July	5.39 1/2	3.22 1/2	3.97	.574
Sep	5.47 1/2	3.14 1/2	3.97	.577
Dec	5.60	3.03	4.02	.576

KC

Mar	5.32 1/2	3.46 1/2	4.16 1/2	.443
May	5.43	3.46 1/2	4.11	.468
July	5.36 1/2	3.40 1/4	3.99 1/2	.505
Sep	5.44 1/4	3.44 1/2	4.05	.514
Dec	5.15	3.44	4.06	.407

WPG Canadian \$/cwt

Mar	8.15	4.92	6.39	.741
May	9.20	5.06	6.52	.754
July	8.28	4.76	6.49	.810
Oct	8.49	4.50	6.29	.819
Dec	8.03	4.62	6.23	.765