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# Back to Basics: Hedging and Basis in Grain Marketing

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## Introduction

**Basis** in grain marketing refers to the difference between the cash and futures prices. It is calculated by subtracting the futures price from the cash price at a given time for a given location. Since futures prices are typically determined in the global market, the basis essentially acts to localize the global prices to local markets.

Having a solid understanding of the basis and its seasonal patterns is crucial to any successful grain marketing plan. In this publication, basis and related concepts will be discussed as they relate to developing an effective marketing plan. We will also explore the basis patterns for wheat in various regions of Idaho. Although the focus is on wheat growers, the concepts and principles discussed are applicable to growers of other crops with an active futures market.

## Hedging and Basis

There are two basic types of hedgers: short hedgers and long hedgers. While many products can be used to manage price risk, we focus on futures contracts and marketing contracts offered by grain elevators or co-ops, which mimic the outcome of futures hedging.

**Hedging** refers to the use of a financial instrument that generates cash flows opposite to those of the main asset in order to mitigate the adverse price risk associated with the main asset. Since cash and futures prices for a given commodity typically move in the same direction, assuming a position in futures opposite to the cash market generates opposing outcomes in the two markets. Using this principle, producers and commodity buyers can use futures contracts to effectively manage price risk in the cash market.

## Short Hedgers

A **short hedger** is someone wishing to sell a commodity at a future date. Wheat growers are short hedgers. They implicitly hold a long position in the cash market as their revenue

declines when prices decrease. The risk to their operation posed by a decrease in cash price—**price risk**—can be mitigated by taking an opposite position in futures markets, i.e., selling (or going short on) futures contracts. In this situation, the futures position realizes a profit in the case of a price decline. The gain in the futures market offsets the loss in revenue when the grain is sold in the cash market.

In Table 1 (left panel), a wheat producer initiates a hedge at T0 by selling a futures contract, when cash and futures prices are \$7.00 and \$6.50, respectively. At T1, cash and futures prices have declined to \$6.70 and \$6.20, respectively. The producer lifts the hedge by buying futures contracts and subsequently sells wheat in the cash market. A gain is realized on the futures position, which offsets the loss incurred in the cash market due to the price decline. As a result, the producer receives a net price of \$6.70 (cash price) along with an additional \$0.30 gain from the hedging in futures for a final price of \$7.00. Without hedging, the producer would have only received \$6.70.

### Long Hedgers

A **long hedger** is someone intending to buy a commodity at a future date. A miller, for instance, is a long hedger in the wheat market. They implicitly hold a short position in the cash market, concerned with rising commodity prices. To mitigate the risk of rising prices, they take an opposite position in the futures market (i.e., buying futures contracts or “going long”). If prices for the commodity increase, they’ll realize a gain in the futures position that counterbalances the increased purchasing cost in the cash market.

In Table 1 (right panel), the miller establishes a hedge at T0 when the cash and futures prices are \$7.00 and \$6.50, respectively. At T1, the cash and futures prices have risen to \$7.30 and \$6.80, respectively. The miller lifts the hedge by offsetting the futures position established earlier and purchases the wheat in the cash market. They have made \$0.30 in the futures market, which offsets the loss in the cash market because of rising prices. The final price the miller pays for wheat is \$7.30 cash price at T1, minus the \$0.30 futures hedging gain, for a net price of \$7.00. If the miller had not employed hedging, the final price they would have paid is \$7.30.

### How Basis Impacts the Hedging Outcome

For both cases in Table 1, hedging with futures contracts is a zero-sum game, where a loss in the cash market is offset by a gain in the futures position. This is because we assume that cash and futures prices experience identical changes between the two time periods. As can be seen, the basis in both periods remains the same, at \$0.50/bushel. In practice, although cash and futures prices move together, the correlation is not perfect. The difference between the cash and futures price (i.e., basis) often changes between when a hedge is initiated and lifted.

The risk of unfavorable movement in the difference between cash and futures prices, called **basis risk**, is an essential concept in commodity marketing and developing a marketing and risk management plan. Basis is usually categorized in two ways:

**Table 1.** Outcomes of a short and long hedge when basis remains constant.

Short Hedger				Long Hedger			
Time	Cash Price	Futures Price	Basis	Time	Cash Price	Futures Price	Basis
T0 (now)	\$7.00	\$6.50	\$0.50	T0 (now)	\$7.00	\$6.50	\$0.50
T1 (later)	\$6.70	\$6.20	\$0.50	T1 (later)	\$7.30	\$6.80	\$0.50
	<i>Loss of \$0.30</i>	<i>Gain of \$0.30</i>			<i>Loss of \$0.30</i>	<i>Gain of \$0.30</i>	
	Final Price	\$6.70 + \$0.30 = \$7.00			Final Price	\$7.30 - \$0.30 = \$7.00	

- **Strong basis:** A relatively high basis. When the basis increases, it is described as “strengthening.”
- **Weak basis:** A relatively low basis. When the basis decreases, it is described as “weakening.”

Table 2 (left panel) illustrates an example of a short hedge where the basis weakens between the time when a hedge is initiated and lifted. Because the decline in futures prices is less than the decline in cash prices, the gain in futures is not sufficient to fully offset the loss in the cash market. The final price the produce receives is lower than the amount in Table 1 when the basis remains constant. In Table 2 (right panel), a strengthening basis is observed between the two time periods. The miller has to pay a higher price compared to the scenario presented in Table 1 because the gain in futures is unable to completely offset the loss in the cash market.

Overall, short hedgers benefit from a strengthening basis, while long hedgers benefit from a weakening basis. The reason is that the final price for a hedger, regardless of long or short hedging, can be calculated as follows:

$$\text{Final Price} = \text{Futures Entry Price} + \text{Final Basis}$$

OR

$$\text{Final Price} = \text{Final Cash Price} + \text{Gain/Loss on Futures}$$

Both calculations yield the same result. For instance, in Table 2, the final price received by the wheat grower can be computed as \$6.50 (futures price at T0) + \$0.30 (basis at T1) = \$6.80.

Table 3 shows the hedging outcomes when the basis has strengthened for short hedgers, while a weakening basis is observed for long hedgers. The producer is able to secure higher selling prices compared to the price scenarios in either Table 1 or Table 2 due to a strengthening basis. Meanwhile, the miller is able to obtain a lower purchasing price because of a weakening basis between T0 and T1.

As seen in Tables 1–3, when hedging with futures, after a hedge is initiated, the only variable impacting the final price is the basis. In essence, hedgers make a fundamental exchange where they are no longer subject to price risk but assume basis risk. In general, basis tends to experience less significant fluctuations

**Table 2.** Outcomes of a short hedge when basis weakens (left) and a long hedge when basis strengthens (right).

Short Hedger				Long Hedger			
Time	Cash Price	Futures Price	Basis	Time	Cash Price	Futures Price	Basis
T0 (now)	\$7.00	\$6.50	\$0.50	T0 (now)	\$7.00	\$6.50	\$0.50
T1 (later)	\$6.70	\$6.40	\$0.30	T1 (later)	\$7.30	\$6.60	\$0.70
	<i>Loss of \$0.30</i>	<i>Gain of \$0.10</i>			<i>Loss of \$0.30</i>	<i>Gain of \$0.10</i>	
	Final Price	\$6.70 + \$0.10 = \$6.80			Final Price	\$7.30 - \$0.10 = \$7.20	

**Table 3.** Outcomes of a short hedge when basis strengthens (left) and of a long hedge when basis weakens (right).

Short Hedger				Long Hedger			
Time	Cash Price	Futures Price	Basis	Time	Cash Price	Futures Price	Basis
T0 (now)	\$7.00	\$6.50	\$0.50	T0 (now)	\$7.00	\$6.50	\$0.50
T1 (later)	\$6.70	\$6.00	\$0.70	T1 (later)	\$7.30	\$7.00	\$0.30
	<i>Loss of \$0.30</i>	<i>Gain of \$0.50</i>			<i>Loss of \$0.30</i>	<i>Gain of \$0.50</i>	
	Final Price	\$6.70 + \$0.50 = \$7.20 or \$6.50 + \$0.70 = \$7.20			Final Price	\$7.30 - \$0.50 = \$6.80 or \$6.50 + \$0.30 = \$6.80	

compared to cash or futures prices, since it represents the difference between two closely related prices. Table 4 summarizes the impact of basis on short and long hedging.

**Table 4.** Impact of basis changes on a hedge.

Basis Behavior	Short Hedger	Long Hedger
Basis strengthens	Gain on hedge	Loss on hedge
Basis weakens	Loss on hedge	Gain on hedge

Many commodities do not have actively traded futures contracts. In such cases, futures contracts whose underlying commodity closely relates to the commodity to be hedged can be used. This is referred to as cross hedging. For instance, Chicago soft red wheat futures contracts are commonly used to hedge soft white wheat prices. Since the underlying commodity of futures contracts and hedged commodity are different, the basis risk can be higher due to a lower degree of correlation between cash and futures prices.

## More on Basis: Some Definitions

Basis can be either positive or negative and what is considered “normal” varies greatly by region and over time. Its value encompasses a wide array of regional factors, but primarily represents the costs associated with transporting the commodity from a local area to a main hub or export terminal. There is also a saying that basis is a measure of relationships, which carries some truth. Merchandisers with larger networks have more flexibility in getting products to their destinations more cost-effectively.

Transportation plays an even more crucial role in the Pacific Northwest (PNW), where a substantial portion of wheat is exported overseas via Portland, Oregon. Wheat is often hauled to Portland via railroad (shuttle trains) or barges, with trucks used for intermediate transportation. Fluctuations in transportation costs throughout the year can consequently impact the basis, ultimately affecting the price received or paid by producers and commodity buyers in the region (see “Essential Definitions to Consider in Relation to Basis” for a quick rundown of some of the relevant terminology).

## Essential Definitions to Consider in Relation to Basis

**Cash bid.** The price that an elevator or coop currently offers for a commodity, often exclusive of other expenses and fees. The exact definition may vary depending on specific circumstances.

**CIF.** Cost of Carry, Insurance, and Freight. It broadly encompasses all costs associated with transporting grain to its destination. When a “CIF price” is quoted, it includes the cost of the grain and all the aforementioned charges. The seller is responsible for delivering the commodity to its destination and bears the transportation costs, meaning they are also liable for the grain until the completion of the delivery.

**FOB.** Free on Board. It refers to the price quoted where the recipient (buyer) of grain is responsible for CIF. With FOB, the buyer bears the risk for the grain during transit to the final destination and is responsible for transportation expenses.

**Off-coast.** Many grain buyers publish off-coast rates, which are used to calculate the FOB price at a local elevator. The adjustment accounts for the transportation costs incurred by the company to transport the grain to a main hub. Over the past few years, off-coast rates in Eastern Washington and Idaho have typically ranged from \$0.60 to \$1.00 per bushel for wheat. For example, a company based in Portland may post a price of \$7.00 for wheat on its website, but the price at the local elevator will be lower after factoring in the current off-coast rate.

Staying informed about transportation cost trends, including rail freight and barge rates, is crucial for producers and commodity buyers so that they can understand the behavior of basis and factors influencing basis in their respective regions. The [United States Department of Agriculture’s \(USDA\) Ag Transport website](#) provides some data on transportation costs. The actual price a producer receives will be the rate published by the company/cooperative minus the off-coast, adjusting for any premiums/discounts for quality.

## Basis for Idaho Wheat

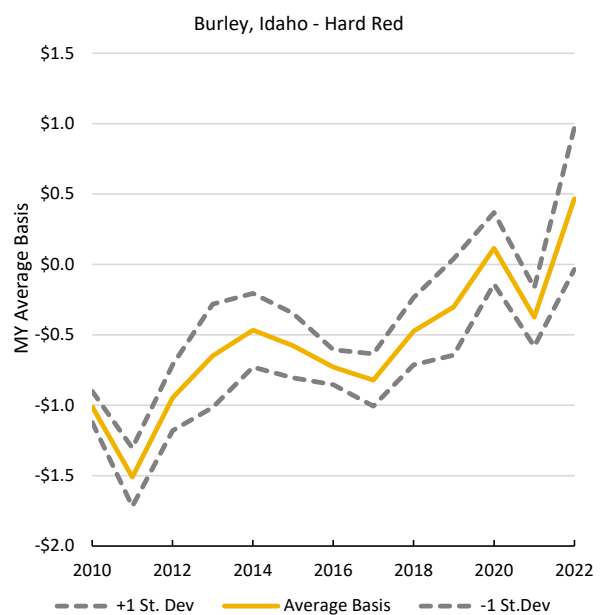
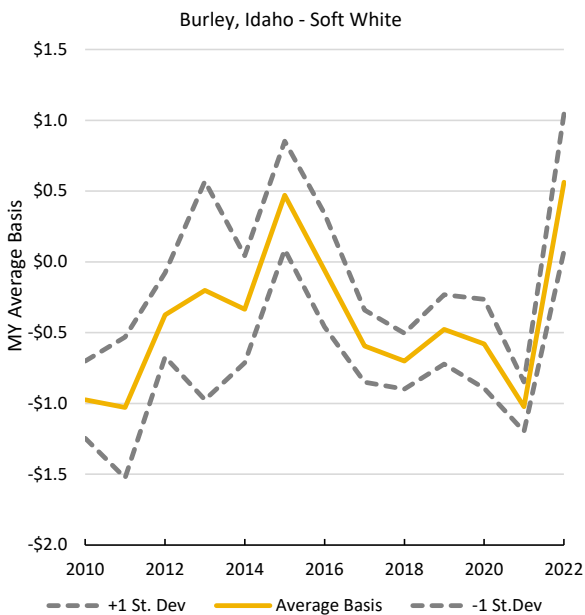
Basis varies significantly depending on location, time period, and commodities. To illustrate these variations, we gathered cash prices for #1 spring wheat (SW) and #1 hard red winter (HRW) (with 11.5% protein) wheat from the Idaho Barley Commission for three locations in Idaho (Burley, Soda Springs, and Lewiston) and Portland from 2009 to 2022. The cash prices were then compared to nearby futures prices to calculate nearby basis, as shown in the appendix. The Chicago soft red winter (SRW) wheat and Kansas City HRW futures contracts are used for SW and HRW wheat, respectively. We can also compute harvest basis, which is the cash bid for harvest delivery minus the futures price for the contract closest to the harvest. We were, however, unable to obtain the forward cash bids for harvest delivery for the three locations. The calculated basis therefore uses the cash price for immediate delivery and the nearby futures contract as opposed to delivery in the harvest season.

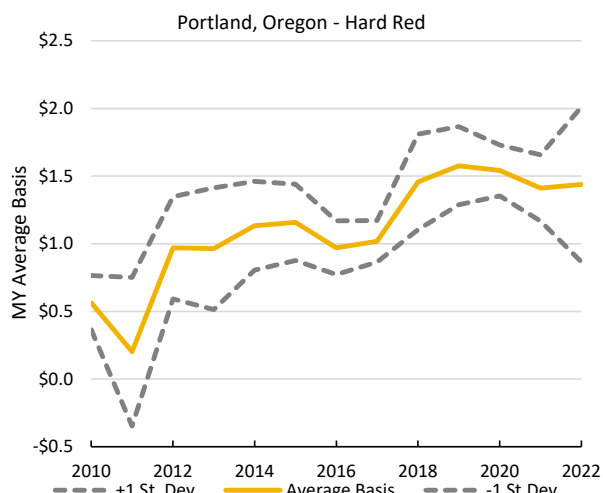
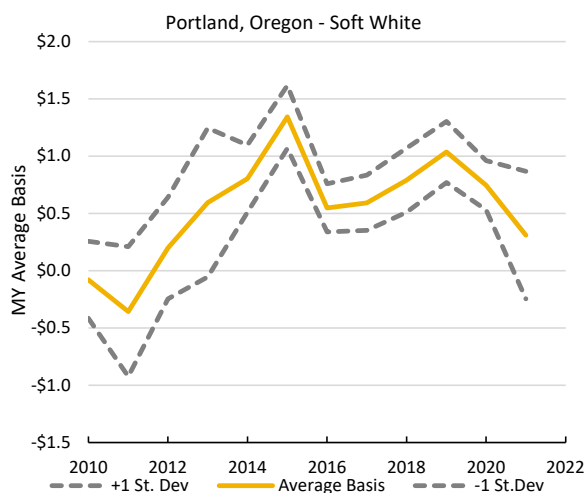
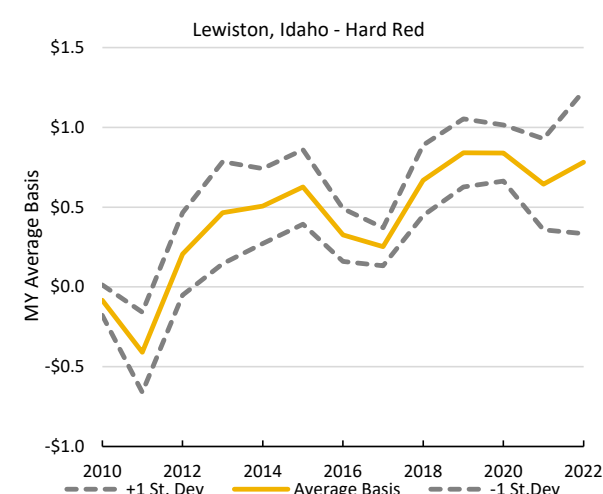
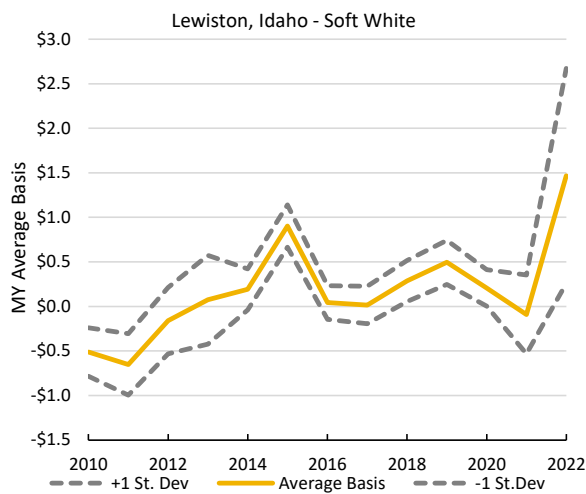
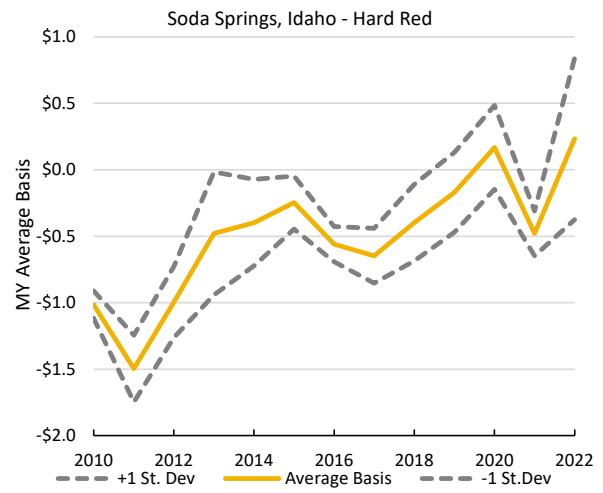
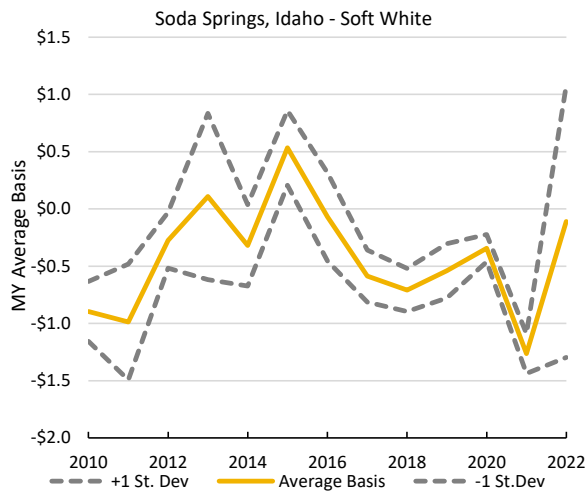
Figure 1 plots the marketing year average basis, along with one standard deviation above and below the average basis. Lewiston, Burley, and Soda Springs are located in north, south-central, and southeastern Idaho, respectively. There is a strong correlation between basis in different locations, most notably between Portland and Lewiston, as well as between

Burley and Soda Springs. Almost all grain in Lewiston is loaded on barges bound for Portland. As such, we expect the basis to be highly correlated between these two markets. However, in other parts of Idaho like Burley and Soda Springs, there are more options for selling grain and we expect the basis in these locations to be less correlated with Portland.

On average, the basis in Portland and Lewiston is positive, indicating higher cash prices relative to futures in these areas. Conversely, the basis in Burley and Soda Springs is typically negative, reflecting the higher transportation costs associated with moving grains to central hubs and export terminals in these regions. For the three Idaho locations, Lewiston has the highest average basis, followed by Soda Springs and Burley.

When examining the coefficient of variation (standard deviation over mean), it becomes evident that the basis for SW wheat appears to be more volatile than that of HRW wheat in most of the cases. One reason is that for HRW wheat, the futures contract used has the same underlying commodity, while for SW wheat the underlying futures commodity is soft red wheat. For SW wheat, the basis exhibits the greatest volatility in Lewiston and the lowest in Portland. Meanwhile, for HRW wheat, the basis is most volatile in Soda Springs and least volatile in Portland.





**Figure 1.** Nearby basis for soft white and hard red winter wheat in Portland and selected locations in Idaho, 2009–22. Notes: For each year, we report the average basis (gold line) and one standard deviation above and below average basis (grey dashed line). Marketing year is from June to the following May. The time frame spans from January 2009 to February 2022 for Burley and from January 2009 to April 2023 for Soda Springs and Lewiston. Where a gap of two months or more exists, the marketing year number was omitted. Data obtained from the Idaho Barley Commission.



Variations across different years are also notable. In the 2020–21 period, the basis became significantly more negative for Soda Springs and Burley, while it became less positive for Lewiston and Portland compared to the previous year. Furthermore, in the 2021–22 period, coinciding with the Russia-Ukraine conflict, the basis experienced a significant increase for all locations.

As discussed previously, short hedgers benefit from a strengthening basis and receive a lower net price when the basis weakens. When the basis is unusually strong relative to the historical level, producers may wish to use a basis contract offered by their local elevators to take advantage of the usually strong basis. Producers may also consider a forward contract with their local elevators in periods of both strong basis and high prices. In contrast, in years with unusually low basis such as 2020–21, producers may wish to use a hedge-to-arrive contract or hedging using futures to postpone setting the basis. Producers should carefully assess the current basis and compare it to the historical basis to determine the best marketing strategies that meet their desired marketing goals.

## Record Your Own Basis

The University of Idaho AgBiz website publishes basis and basis charts to help producers and commodity buyers stay current with the market. These charts, while useful, are based on Portland cash prices. If a producer can obtain data from local elevators and update it regularly, they can create basis charts specific to their local market. We recommend that growers and commodity buyers maintain their own basis dataset by periodically recording cash and futures prices.

## Where Can I Get Cash Price Data?

Getting good data can be more challenging than anticipated. A few places that provide cash price data include the following:

- Local elevator/merchandiser/grain elevator: If a producer has established a business relationship with a local elevator or merchandiser, they can inquire with the staff about historical cash prices in their specific location. These businesses often have access to accurate and up-to-date cash price data.
- University of Idaho Extension: Except for Portland cash prices, UI Extension currently does not have a continuously maintained dataset for cash prices.
- Idaho Barley Commission (IBC): The [IBC website](#) periodically provides weekly price quotes for wheat and barley in a few locations in Idaho. This data is used herein.
- USDA Ag Transport: The USDA maintains a [cash price and basis dataset](#). At the time of this bulletin's publication, the available data for the PNW is limited to Portland cash prices.
- Online services: Some paid services collect cash market prices from various elevators. However, make sure they cover your specific location before purchasing a subscription.

## Which Wheat Futures Contract Should Be Used?

Three types of wheat futures contracts are traded in the United States, including SRW wheat traded on the Chicago Board of Trade, HRW wheat traded on the Kansas City Board of Trade, and hard red spring (HRS) wheat traded on the Minneapolis Grain Exchange. Producers and commodity buyers should select the futures contract that closely corresponds to the class of wheat being hedged. For example, an SW grower in the PNW should consider the Chicago SRW contract. Contact your local elevators to find out what contract to use in hedging to ensure accurate basis calculations.

## Which Contract Month Should Be Used to Compute the Basis?

Use the futures contract month that aligns closest to the anticipated timing of the actual cash market activity. For example, Chicago SRW futures delivery months include March, May, July, September, and December. If a producer is looking to deliver in mid-July, they should use the September contract.

## How Often Should the Prices Be Recorded?

While daily recordings offer the most detailed information, it may not always be a practical routine for all market participants. In such cases, try to record prices once a week. Pick a day of the week that the market will usually be open. Stay consistent with recording the price for that day of the week.

# Appendix

Nearby basis for soft white (SW) and hard red winter (HRW) wheat in Portland and selected locations in Idaho, 2009–22.

Marketing Year	Burley, Idaho		Soda Springs, Idaho		Lewiston, Idaho		Portland, Oregon	
	SW	HRW	SW	HRW	SW	HRW	SW	HRW
2009/10	-\$0.97	-\$1.01	-\$0.89	-\$1.01	-\$0.51	-\$0.08	-\$0.08	\$0.56
	(0.27)	(0.11)	(0.26)	(0.10)	(0.27)	(0.10)	(0.34)	(0.20)
2010/11	-\$1.03	-\$1.51	-\$0.99	-\$1.50	-\$0.65	-\$0.41	-\$0.36	\$0.20
	(0.50)	(0.21)	(0.51)	(0.25)	(0.35)	(0.25)	(0.57)	(0.55)
2011/12	-\$0.37	-\$0.95	-\$0.27	-\$0.99	-\$0.16	\$0.21	\$0.20	\$0.97
	(0.30)	(0.23)	(0.24)	(0.27)	(0.37)	(0.26)	(0.44)	(0.38)
2012/13	-\$0.20	-\$0.65	\$0.11	-\$0.48	\$0.07	\$0.47	\$0.59	\$0.96
	(0.77)	(0.37)	(0.73)	(0.46)	(0.50)	(0.32)	(0.65)	(0.45)
2013/14	-\$0.34	-\$0.47	-\$0.32	-\$0.40	\$0.19	\$0.51	\$0.80	\$1.13
	(0.38)	(0.26)	(0.36)	(0.33)	(0.23)	(0.24)	(0.29)	(0.33)
2014/15	\$0.47	-\$0.58	\$0.53	-\$0.25	\$0.90	\$0.63	\$1.34	\$1.16
	(0.38)	(0.23)	(0.33)	(0.20)	(0.24)	(0.23)	(0.27)	(0.28)
2015/16	-\$0.06	-\$0.73	-\$0.07	-\$0.56	\$0.04	\$0.33	\$0.55	\$0.97
	(0.40)	(0.12)	(0.38)	(0.13)	(0.19)	(0.17)	(0.21)	(0.20)
2016/17	-\$0.59	-\$0.82	-\$0.59	-\$0.65	\$0.02	\$0.25	\$0.59	\$1.02
	(0.26)	(0.19)	(0.23)	(0.21)	(0.21)	(0.12)	(0.24)	(0.15)
2017/18	-\$0.70	-\$0.47	-\$0.71	-\$0.40	\$0.29	\$0.67	\$0.79	\$1.46
	(0.20)	(0.24)	(0.19)	(0.29)	(0.23)	(0.22)	(0.28)	(0.35)
2018/19	-\$0.48	-\$0.30	-\$0.54	-\$0.17	\$0.49	\$0.84	\$1.04	\$1.58
	(0.25)	(0.34)	(0.24)	(0.30)	(0.25)	(0.21)	(0.27)	(0.29)
2019/20	-\$0.58	\$0.12	---	\$0.17	\$0.21	\$0.84	\$0.74	\$1.54
	(0.31)	(0.25)	---	(0.32)	(0.20)	(0.18)	(0.22)	(0.19)
2020/21	-\$1.02	-\$0.37	-\$1.26	-\$0.48	-\$0.09	\$0.64	\$0.31	\$1.41
	(0.18)	(0.21)	(0.17)	(0.17)	(0.44)	(0.29)	(0.56)	(0.24)
2021/22	---	---	-\$0.11	\$0.23	\$1.47	\$0.78		\$1.44
	---	---	(1.19)	(0.61)	(1.21)	(0.45)	---	(0.57)
2009–2022	-\$0.46	-\$0.60	-\$0.45	-\$0.48	\$0.15	\$0.42	\$0.55	\$1.11
	(0.62)	(0.53)	(0.67)	(0.56)	(0.67)	(0.43)	(0.60)	(0.51)

Notes: For each year, we report the average basis and its standard deviation (in parenthesis). Marketing year runs from June to the following May. The time frame spans from January 2009 to February 2022 for Burley and from January 2009 to April 2023 for Soda Springs and Lewiston. Where a gap of two months or more exists, the marketing year number is omitted. Data obtained from the Idaho Barley Commission.

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