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A Guide to Price-Risk Management in Grain Marketing

for North Carolina, South Carolina, and Georgia

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Introduction

Agricultural producers face many different risks, ranging from production, price, and financial risks to environmental, health, and legal risks. Moreover, government policy can affect the sources and levels of risk. One such risk is price risk—the possibility that the selling price of a crop will decline, perhaps to a less-than-profitable level. To manage this risk, a producer must achieve a balance between the different goals of locking in a profit level and preserving opportunities to benefit from favorable marketing conditions.

Alternatives for managing price risk include marketing instruments (a wide range of cash grain contracts, futures markets, and options markets) and crop insurance (revenue protection). None of these alternatives alone will achieve the desired balance. In most situations, a balanced risk plan will require using a combination of marketing instruments, insurance products, and the farm programs offered by the government.

Recent Farm Bills have been aimed at encouraging producers to use market-based alternatives to manage price risk. Current farm policy offers crop producers a three-tiered safety net that can work in concert with market-based alternatives. Producers must understand each of these farm programs and market-based alternatives to combine them in an effective price-risk management strategy. The performance of such a risk-management plan will depend upon market conditions at planting and at harvest in a given location. Where are the markets and sources of supplies? What modes of transportation are available: road, rail, or water? How much will transportation and storage cost?

Within that context, a producer must decide what to plant, whether to purchase crop insurance or to self-insure, and how and when to sell the expected harvest. All of these decisions will jointly influence the level of production, price-risk exposure, and profits. The uncertainties involved in production and prices mean that "no one size fits all." Each individual's risk tolerance and financial situation affect the best price-risk management alternatives for a specific situation.

Because effective price-risk management depends on the situation, this publication focuses on the topic of price-risk management for corn, wheat, and soybean marketing in the Southeast, particularly the tri-state region composed of North Carolina, South Carolina, and Georgia. The Southeast region has unique characteristics that distinguish it from the Midwest and the Corn Belt, and they affect risk-management choices. To manage price risk effectively, producers in the region need information about those distinctions and the available marketing alternatives.

We have developed this publication to answer the following questions: How have prices for grains and soybeans fluctuated historically in the three states? What are the market-based alternatives that can be used to offset price risk? Which of the available government programs work best with the alternatives to achieve a balanced risk-management plan?

With this information, a producer can develop a number of different strategies to use. This publication focuses only on some basic and simple strategies that can serve as a foundation for more sophisticated approaches.

Contents

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Chapter 1. Price Risk, Futures Price, and Basis

What Is Price Risk?

A producer plants a crop making the basic assumption that at harvest, or sometime thereafter, he or she will be able to deliver the crop to a buyer for a profit. Between planting and harvest, or that "sometime thereafter," there is substantial probability for the price to either increase or decrease. A price increase is typically viewed as an opportunity or good fortune. A price decrease is typically viewed as risk or bad fortune.

This inherent riskiness in cash price can be best illustrated using a probability density function (PDF). A PDF plots the likelihood that any one price within the feasible range of prices will be realized when a producer sells a crop. In a PDF plot, the height of the curve from the horizontal axis (the amount of mass) can intuitively be thought of as a measure of the likelihood of observing that value. A PDF can be thought of as a "smoothed" histogram. This is illustrated in Figure 1-1, which depicts both a "more risky" and a "less risky" range of prices. For example, at planting, the PDF of cash soybean prices projected for harvest time might be represented by the more risky PDF shown in Figure 1-1, the solid line. Based on this PDF, the most likely price at harvest would be $5.30 per bushel. But the price could be as low as $4.00 or as high as $6.50, or any price in between, although these extremes mentioned are not very likely to be observed. The range of values and the shape of this PDF illustrate the riskiness of the cash price.

Although the less risky PDF, the dotted line, has the same most likely outcome of $5.30 per bushel, it has a much narrower range of values and therefore a much skinnier and peaked shape than the more risky PDF. The range of this less risky PDF is $4.50 to $6.00. Thus, closer to harvest when more is known about yields and expected prices, we would expect to see the shape of the PDF transform to the skinnier and more peaked shape.

Price-risk management strategies seek to accomplish one of two alternatives: either to lock in a price level or to establish a price floor. Locking in a price level entails establishing a price that is as far to the right side of the horizontal axis as possible with all of the price uncertainty being removed. For example, side A of Figure 1-2 shows the transformation of the PDF from a bell-shape to a *vertical line* when a producer locks in a price of $6.00 per bushel. That is, by locking in the price, there is no longer any uncertainty. Both

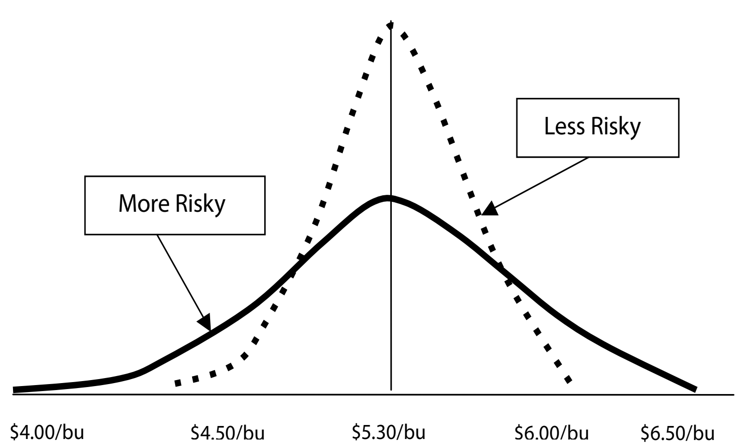


Figure 1-1. Probability density function (PDF) for cash soybean price at harvest.

price risk (bad fortune) and price opportunity (good fortune) are eliminated. A forward contract is one way to lock in a price level because the producer promises to deliver a product at a specific time for a set price.

Side B of Figure 1-2 shows the transformation of the PDF from a bell-shape to a truncated bell-shape absent a left side tail when a producer establishes a price floor of $5.00 per bushel (in other words, the downside risk or the probability of the price being below $5.00—the floor—is zero). That is, by setting a price floor, some of the price risk has been eliminated but the potential for price good fortune remains. A hedge using a put option is one way to establish a price floor and still have the possibility of benefiting from a price rally.

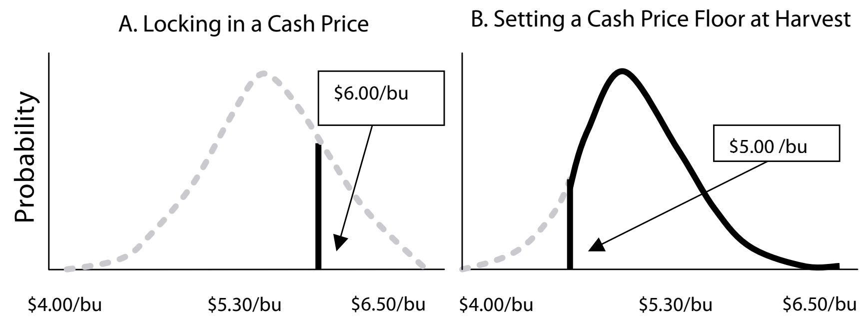


Figure 1-2. Transforming the PDF by locking-in a price or setting a price floor.

What Is Basis?

Basis can be thought of as the economics of where and when. More concretely, basis can be defined as *the difference between local cash prices and futures prices for commodities at a given point in time.* This difference can be expressed in a simple formula:

Basis = Local Cash Price – Futures Price

Using this definition of basis we can also express local cash price as a simple formula, the sum of futures price plus basis:

Local Cash Price = Futures Price + Basis

It is important to note that basis refers to a local product with identical specifications to the futures contract specifications. If a product differs in quality from the specifications, its selling price will be affected. As Figure 1-1 shows, the local cash price at harvest is a random variable, and its inherent riskiness can be expressed in the form of a PDF. It also shows that the PDF for local cash prices can also be thought of *conceptually* as the sum of the PDFs for two random variables, futures price and basis, at harvest. This is depicted in Figure 1-3, where the shape of the cash price PDF reflects the sum of the futures price PDF and the basis PDF at harvest.

By comparing the shape of the PDFs, we can see that most of the riskiness in the cash price stems from the riskiness observed in the futures PDF. We can also see that much less risk stems from the basis PDF. This relationship is fundamental to managing price risk. Local cash price is determined by the sum of futures prices and local basis.

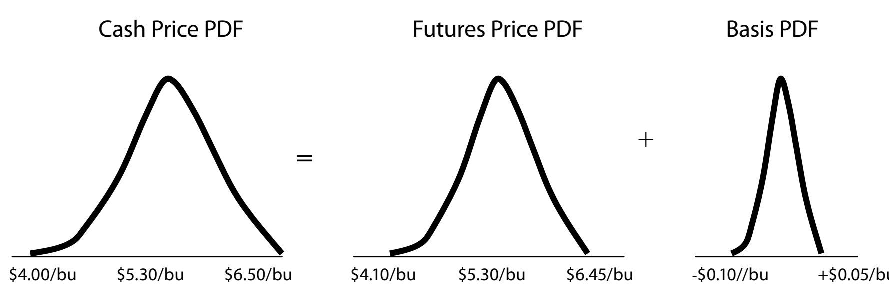


Figure 1-3. Cash price, futures price, and basis probability density functions (PDFs)

Managing Price Risk

Clearly, understanding and making effective risk-management decisions to manage local cash price risk means that we must understand and manage futures price risk and basis risk. Fortunately, the futures and options markets allow producers to gather significant amounts of information concerning the riskiness of futures price levels (the shape of the futures price PDF). These markets also offer opportunities to *hedge* or offset this risk by using a futures or options contract as a temporary substitute for a cash transaction that will occur later.

Information concerning the local basis is less readily available. The remainder of this publication will focus primarily on documenting and characterizing what the basis PDF looks like for particular locations at different times using historical estimates. Understanding what the basis PDF looks like will enhance a producer's ability to make effective risk-management decisions and to evaluate current bids and offers.

Chapter 2 documents the historical basis for Georgia, North Carolina, and South Carolina for corn, wheat, and soybeans between 1997 and 2002. Supplemental tables that display the cash price and basis information (in Excel spreadsheet format) for 47 soybean locations, 54 corn locations and 33 wheat locations within the region are available at the following Web site:

http://www.ag-econ.ncsu.edu/faculty/piggott/handbook.htm

Based on these data, we explain in Chapter 2 how basis has changed in each state, for each commodity, over the study period and offer possible explanations for the changes. Several factors have region-wide influence on basis relationships.

In Chapter 3 we demonstrate how historical basis can be used to evaluate different marketing strategies that can help a producer manage price risk—from cash bids and forward contract offers to taking a position in the futures market. We also explain how basis data can be used in deciding when to sell a crop and whether to store a commodity for later sale.

In Chapter 4, we discuss the advantages and disadvantages of different marketing strategies and how they interact with the provisions of the 2002 Farm Bill, especially the loan program and the resulting loan deficiency program (LDP) safety net. If used wisely, these programs can be used to increase crop income above the level of cash market sales.

Chapter 2. How Basis Varies: Trends and Seasonal Patterns, 1997-2002

We noted in Chapter 1 that basis can be thought of as the economics of where and when. It reveals the difference between two prices—cash price and nearby futures contract price—for a commodity at a given time and place. Using basis as a measure, we can track the difference between these two prices for a crop across locations and seasons. We can also see how these prices for a crop will probably behave in the future based on their relative differences in the past.

Many factors affect basis levels within a given region, including supply and demand within the market area; availability of storage, handling, and processing facilities; the volume of imports; and the cost of transportation to the area. In this chapter, we identify and discuss some common factors affecting basis across North Carolina, South Carolina, and Georgia. This is followed by a description of trends in basis for each state from 1997 through 2002, by crop, market area, and

Table 2-1. Tri-state Acreage, Yields, and Production of Grains and Cotton: 1990, 1997, and 2002

	1990				1997				2002			
	Planted Acres	Harv. Acres	Yield	Produced	Planted Acres	Harv. Acres	Yield	Produced	Planted Acres	Harv. Acres	Yield	Produced
	(thou)	(thou)	(bu/ac)	(thou bu)	(thou)	(thou)	(bu/ac)	(thou bu)	(thou)	(thou)	(bu/ac)	(thou bu)
Wheat												
N.C.	600	550	41	22,550	730	670	51	34,170	650	480	42	20,160
S.C.	400	380	38	14,440	310	300	50	15,000	210	190	37	7,030
Ga.	650	590	35	20,650	400	350	44	15,400	350	200	41	8,200
Total	1,650	1,520	38.0	57,640	1,440	1,320	48.3	64,570	1,210	870	40.0	35,390
Corn												
N.C.	1,200	1,070	68	72,760	960	870	89	77,430	790	700	83	58,100
S.C.	390	320	48	15,360	350	325	95	30,875	320	260	46	11,960
Ga.	660	550	68	37,400	500	450	105	47,250	340	290	115	33,350
Total	2,250	1,940	61.3	125,520	1,810	1,645	96.3	155,555	1,450	1,250	81.3	103,410
Soybeans												
N.C.	1,400	1,350	24	32,400	1,400	1,330	29	38,570	1,360	1,280	23.5	30,080
S.C.	800	750	18.5	13,875	580	570	22.5	12,825	435	415	17	7,055
Ga.	900	700	14	9,800	400	380	21	7,980	160	140	21	2,940
Total	3,100	2,800	18.8	56,075	2,380	2,280	24.2	59,375	1,955	1,835	20.5	40,075
Grain Total	7,000	6,260		239,235	5,630	5,245		279,500	4,615	3,955		178,875
Cotton			(bu/ac)	(thou bale)			(bu/ac)	(thou bale)			(bu/ac)	(thou bale)
N.C.	201	200	631	263	690	685	652	930	940	920	421	806
S.C.	155	154	452	145	290	286	688	410	290	200	314	131
Ga.	355	350	555	405	1,440	1,425	646	1,919	1,450	1,360	557	1,578
Cotton Total	711	704	546.0	813	2,420	2,396	662.0	3,259	2,680	2,480	430.7	2,515

Source: NASS, USDA

season, with brief explanations of the factors that have influenced basis. Finally, we summarize some key observations for the tri-state region by crop.

Regional Factors

Several changes in supply and demand common to all three states significantly influenced grain and soybean basis during the 12-year period of 1990 through 2002:

- Reduced locally-produced grain and soybean supplies caused by shifts in acreage away from these crops and toward cotton production.
- Changes in grain and soybean use that accompanied some important changes in livestock production.
- Increased reliance on grain and soybeans produced outside of the region.

These factors have contributed to a greater need for transportation of imported grains and soybeans into the region to meet livestock industry demands in the presence of growing local grain and soybean deficits.

Reductions in Grain and Soybean Production

A comparison of production levels for 1990 and 2002 indicates that the tri-state region experienced production declines over the 12-year period: 38.6 percent in wheat, 17.6 percent in corn, and 28.5 percent in soybeans (Table 2-1). In contrast, cotton production during the same period increased by 209.3 percent. These changes in production can be linked to changes in the acreage devoted to each crop. The number of acres devoted to wheat declined by 26.7 percent, to corn by 35.6 percent, and to soybeans by 36.9 percent. Cotton acreage, however, increased by 276.9 percent.

Table 2-1. (continued)

	1990 –1997		1997 – 2002		1990 – 2002	
	Planted Acres	Produced	Planted Acres	Produced	Planted Acres	Produced
	(percentage of increase or decrease)					
Wheat						
N.C.	+21.7	+51.5	-11.0	-41.0	+ 8.3	-10.6
S.C.	-22.5	+ 3.9	-32.3	-53.1	-47.5	-51.3
Ga.	-38.5	-25.4	-12.5	-46.8	-46.2	-60.3
Total	-12.7	+12.0	-16.0	-45.2	-26.7	-38.6
Corn						
N.C.	-20.0	+ 6.4	-17.7	-25.0	-34.2	-20.1
S.C.	-10.3	+ 101.0	-8.6	-61.3	-17.9	-22.1
Ga.	-24.2	+26.3	-32.0	-29.4	-48.5	-10.8
Total	-19.6	+23.9	-19.9	-33.5	-35.6	-17.6
Soybeans						
N.C.	0.0	+19.0	-2.9	-22.0	-2.9	-7.2
S.C.	-27.5	-7.6	-25.0	-45.0	-45.6	-49.2
Ga.	-55.6	-18.6	-60.0	-63.2	-82.2	-70.0
Total	-23.2	+5.9	-17.9	-32.5	-36.9	-28.5
Grain Total	-19.6	+16.8	-18.0	-36.0	-34.1	-25.2
Cotton						
N.C.	+243.3	+253.6	+36.2	-13.3	+367.7	+206.5
S.C.	+87.1	+182.8	+0.0	-68.0	+87.1	-9.7
Ga.	+305.6	+373.8	+0.7	-17.8	+308.5	+289.6
Cotton Total	+240.4	+300.9	+10.7	-22.8	+276.9	+209.3

What caused this shift toward cotton? Successful boll weevil eradication programs eliminated the pest from the Southeast in the late 1980s, which reduced the cost of growing cotton. In the mid- to late-1990s, both herbicide-tolerant and insect-resistant varieties of cotton were introduced and widely adopted. More recently, the 2002 Farm Bill contained favorable subsidies for cotton that should fortify these regional trends in production acreage. Supplies of grain and soybeans are not likely to increase in the region unless strong outside factors change current conditions or farm policy. Evidence exists that others perceive this trend. Late in 2002, an import facility opened in Wilmington, North Carolina, to import soybean meal products and wheat from foreign countries. Grain products are also imported through the port facility near Brunswick, Georgia.

Changes in Grain and Soybean Use

Livestock expansion also has affected grain demand within the tri-state region. One way to quantify grain demand is to employ feed-use data and grain consuming animal units (GCAUs), factors that allow comparisons of grain demand among different types of livestock. One GCAU is 2.15 tons, and the USDA has developed a different factor for each type of livestock, based on the average amount that one such animal consumes in a year. For example, a dairy cow has a GCAU factor of 1.0474, while a broiler has a factor of 0.002. Using these factors, we can see that one dairy cow will use the same amount of grain (1.0474 × 2.15 tons = 2.25 tons) in a year as approximately 523 broilers (one broiler will consume 0.002 × 2.15 tons = 0.0043 tons, and 2.25 divided by 0.0043 equals 523 broilers).

Table 2-2 lists the number of GCAUs (in thousands) estimated for each livestock type in North Carolina, South Carolina, and Georgia in 1990, 1997, and 2002. The table also lists the total livestock feed use for each year if all the GCAUs are converted to bushels of corn (corn equivalency units). Note that the greatest regional growth has occurred in broilers and hogs—livestock with substantial feed grain and protein meal requirements. A general shift away from dairy, layer, and turkey production has occurred, and feed use for these livestock categories has decreased.

To get a sense of the scale of the deficit, consider the case of corn and wheat (Table 2-3). In 2002, the estimated feed use in the tri-state region was approximately 678 million bushels, while total wheat and corn production amounted to 138.8 million bushels (Table 2-1). Thus, during 2002, the region produced approximately 21 percent of its total feed grain needs for its livestock. This equates to a 77-day supply or slightly more than two months. The effects of this deficit could be devastating if outside supplies were to become unavailable or more costly. Moreover, these deficit figures assume that all corn and wheat produced would be fed to livestock. Yet other market channels, principally wheat and corn milling and exports, are active and also consume these commodities. Thus, these data most likely understate the true nature of the region's grain deficit for feed.

Increased Reliance on Outside Grain

Due to this regional grain and soybean deficit, grain purchasing by the major integrated poultry and hog feed-mill operators has changed. Feed mills have become more dependent on corn brought in by rail from the Midwest and the Corn Belt to meet demands. Livestock producers in North Carolina have turned to importing feed supplies from foreign countries as evidenced by the opening of the offloading facility in Wilmington, North Carolina, in late 2002. The facility's capacity is 600,000 metric tons annually. If the entire capacity were to be used for corn, this would be about 23 million bushels annually. Alternatively, if the entire capacity were to be used for soybeans, this would be about 22 million bushels annually. But consider the tri-state region's total demand

Table 2-2. Estimated Tri-state Grain Consuming Animal Units (GCAU) and Corn Equivalent (CEQ) Use by State and Livestock Category: 1990, 1997, and 2002.

	Grain Consuming Animal Units (thou bu)							Total CEQs (thou bu)
	Beef	Broilers	Layers	Turkeys	Dairy	Hogs	All	
North Carolina								
1990	41	1,081	418	899	149	640	3,228	247,807
1997	59	1,330	373	829	117	2,194	4,902	376,345
2002	52	1,470	240	705	101	2,194	4,761	365,567
Δ 1990 -1997	+42%	+23%	-11%	-8%	-21%	+243%	+52%	+52%
Δ 1997 - 2002	-12%	+11%	-36%	-15%	-14%	0%	-3%	-3%
Δ 1990 - 2002	+25%	+36%	-43%	-22%	-32%	+243%	+48%	+48%
South Carolina								
1990	29	167	155	85	56	94	586	44,963
1997	26	366	123	174	38	70	796	61,123
2002	24	386	117	153	29	69	777	59,672
Δ 1990 -1997	-10%	+119%	-20%	+104%	-32%	-26%	+36%	+36%
Δ 1997 - 2002	-11%	+6%	-5%	-12%	-22%	-2%	-2%	-2%
Δ 1990 - 2002	-20%	+131%	-25%	+80%	-47%	-27%	+33%	+33%
Georgia								
1990	68	1,709	514	31	158	251	2,732	209,718
1997	74	2,364	649	3	141	119	3,350	257,178
2002	68	2,581	444	0	120	79	3,292	252,742
Δ 1990 -1997	+8%	+38%	+26%	-91%	-11%	-53%	+23%	+23%
Δ 1997 - 2002	-8%	+9%	-32%	-100%	-15%	-34%	-2%	-2%
Δ 1990 - 2002	-1%	+51%	-14%	-100%	-24%	-69%	+21%	+21%
Tri-state Region								
1990	139	2,957	1,086	1,015	362	985	6,545	502,488
1997	160	4,059	1,145	1,006	296	2,382	9,048	694,646
2002	143	4,437	800	859	250	2,341	8,831	677,981
Δ 1990 -1997	+15%	+37%	+5%	-1%	-18%	+142%	+38%	+38%
Δ 1997 - 2002	-10%	+9%	-30%	-15%	-16%	-2%	-2%	-2%
Δ 1990 - 2002	+3%	+50%	-26%	-15%	-31%	+138%	+35%	+35%

Note: GCAU factors are feeder cattle = .0547, broilers = .002, layers = .0217, turkeys = .0155,
dairy (cow + calf) = 1.0474, and hogs = 0.2285; 1 GCAU consumes 2.15 tons per year.
Δ = change in consumption level based on estimated GCAUs
Source: ERS, USDA

Table 2.3. Tri-state Region Estimated Grain Production, Use, and Deficit: 1990, 1997, and 2002

Year	All GCAUs	Required CEQs	Corn			Wheat		Corn and Wheat		
			Production	Deficit	% of Use Grown	Production	Adjusted[1] Production	Production	Deficit	% of Use Grown
	(thou)	(thou bu)	(thou bu)	(thou bu)		(thou bu)	(thou bu)	(thou bu)	(thou bu)	
1990	6,545	502,488	125,520	376,968	25%	57,640	61,757	187,277	315,211	37%
1997	9,048	694,646	155,555	539,091	22%	64,570	69,182	224,737	469,908	32%
2002	8,831	677,981	103,410	574,571	15%	35,390	37,918	141,328	536,653	21%

[1]Wheat reported in 60-pound bushels is adjusted to 56-pound bushels for comparison with corn.

for these crops. Each of these levels represents only a small fraction of the region's total demand for the crop. Thus, an offloading facility such as the one in Wilmington, North Carolina, can be thought of as a form of supplemental insurance against deficits rather than a substitute for imports from the Midwest and Cornbelt. The Brunswick, Georgia, port facility has offloaded oats for several years. The potential that additional importing facilities will locate in the region is great, given the likelihood of growing feed deficits as the livestock industry continues to expand.

State Trends in Soybean and Grain Basis, 1997-2002

The regional factors noted above affect local basis in combination with other factors that are unique to each state and market area. Our descriptions of basis trends in this chapter are based on price data collected for six-years, from the beginning of 1997 through the end of 2002. We calculated average monthly and annual prices per bushel for corn, wheat, and soybeans from the local cash prices for a market area. The futures contract price used to generate each basis estimate was the nearby futures contract price. The nearby futures contract is the next futures contract closest to expiration, rolling to the next contract or the first day of the month of expiration.

Consider soybeans, for example. The contract months for soybeans are January, March, May, July, September, and November. So, from May 1 through June 31, the cash price would be compared to the July futures contract price because the July futures contract is the next contract closest to expiration. Likewise, from November 1 to December 31, the cash price would be compared to the January futures contract (the next futures contract closest to expiration). And on January 1, the futures contract used for comparison would rollover to the March futures contract, and so on, for our calculations. All futures contract data used in this publication and the supplementary tables are the daily settlement prices from the Chicago Board of Trade.

By comparing these monthly basis averages, we developed histories of how basis has varied in each state and market area for each crop over a six-year period. We also developed month-by-month profiles that depict average basis highs and lows by market area during a calendar year. All of the basis values reported here are monthly averages per bushel for the specified period. The price and basis data for each market area and crop (except for wheat in North Carolina, which are not available) in this tri-state region can be downloaded from the supplemental tables posted at the following Web site:

http://www.ag-econ.ncsu.edu/faculty/piggott/handbook.htm

North Carolina

Trends in North Carolina grain basis have been mixed. Corn basis has consistently weakened across the state, with the most significant weakening in the central and western market areas (Table 2-5). Soybean basis, on the other hand, has generally strengthened in the central and western areas but weakened in the eastern. Several prominent factors have affected these changes in grain basis for North Carolina.

As Table 2-1 shows, corn and soybean acreage declined in North Carolina. Planted corn acreage in 2002 was 17.7 percent less than in 1997, whereas planted soybean acreage was 2.9 percent less than in 1997. This acreage has shifted into cotton production, with cotton acreage increasing 36.2 percent over the same period. The decline in planted acreage, combined with unfavorable yields in 2002 compared to 1997, resulted in reduced supplies: 25 percent less corn and 22 percent fewer soybeans in 2002 than in 1997.

Demand for corn and soybeans in North Carolina, however, has increased significantly since 1990 (Table 2-2). The GCAUs in North Carolina increased by 52 percent from 1990 to 1997 then declined slightly by 3 percent from 1997 to 2002, for a net gain of 48 percent from 1990 to 2002. This can be attributed to significant growth in hog (243 percent) and beef (42 percent) production from 1990 to 1997. The recent declines can be attributed to stagnant hog numbers, combined with declines in beef (12 percent), layer (36 percent), turkey (15 percent), and dairy (14 percent) production between 1997 and 2002. Only broilers showed an increase over the period—by 11 percent.

The increased demand for and declining supply of grains and soybeans have led to rising deficits and increased reliance on out-of-state sources for

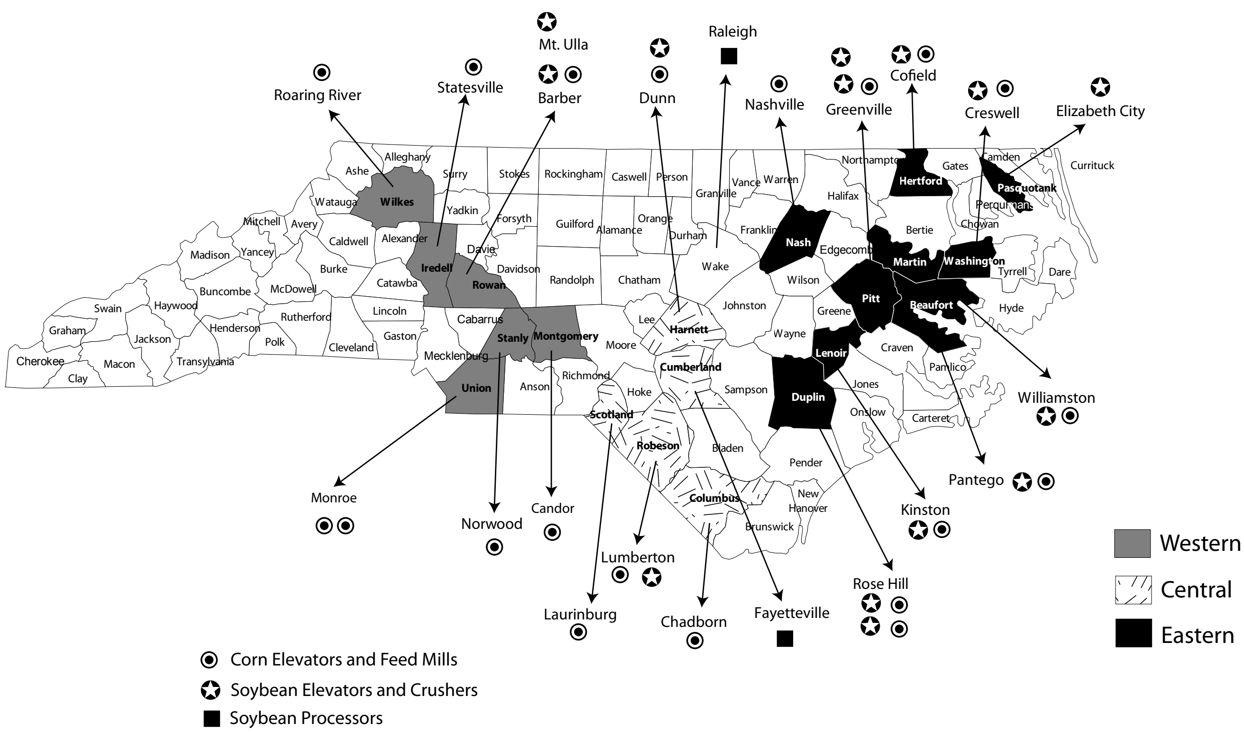


Figure 2-5. Corn and soybean market areas in North Carolina.

Tracking Basis—North Carolina 1997–2002

- A shift from corn and soybeans to cotton
- Increased demand from hog production
- Increasing dependence on railed-in corn
- Decline in soybean-crushing capacity

corn and soybean meal. With less corn flowing through the intrastate system, some corn-buying points closed down, thus reducing competition. For example, corn-buying markets in Greenville (Cargill), Kinston, and Williamston closed in 2000. And rail contracts that stipulate high-volume purchases of grain from suppliers served by rail lines have increased the amount of corn railed into the state. These contracts have weakened demand for local corn and thus have had an unfavorable impact on basis.

North Carolina has also experienced a decline in soybean-crushing capacity, a trend that has occurred throughout the Southeast. A soybean-crushing plant in Cofield (Perdue Farms) closed in 2001. Reduced crushing capacity in the state's eastern market area contributed to a weakening of soybean basis. This means that North Carolina has most of its remaining soybean-crushing capacity located in the central region of the state. Cargill has soybean-crushing plants located in Fayetteville and Raleigh.

On the other hand, basis strengthened slightly in central and western North Carolina from 1997 through 2002. With the overall decline in the state's soybean production, an increasing proportion of soybeans crushed in Fayetteville and Raleigh have had to be railed in from the state's other market areas. This has strengthened soybean basis in the central and western areas because these crushing facilities have had to offer more attractive prices to procure enough soybeans to meet their needs.

North Carolina—Basis Trends by Market Area

Corn. Corn basis weakened across North Carolina during the six-year period (Table 2-5). The decline in corn basis has been as much as 10 cents a bushel in the central market area. The western area experienced a similar weakening—a decline of 9 cents. Less weakening occurred in the eastern area, which has a high concentration of livestock and a greater number of buying points. Basis here weakened by 7 cents.

Soybeans. Although soybean cash prices were less than futures contract prices across North Carolina, soybean basis did strengthen slightly in all but the eastern market area. It strengthened as much as 9 cents in western North Carolina, from minus 29 cents to minus 20 cents. Following a similar but less dramatic pattern, soybean basis also strengthened in the central area with an average basis of minus 8 cents increasing slightly to minus 6 cents. Finally, as noted for the corn market, the eastern North Carolina area, where the majority of the soybeans are produced, experienced a weakening in basis. The average basis of minus 16 cents further weakened to minus 23 cents— a decline of 7 cents.

Table 2-5. North Carolina Grain Basis by Market Area: 1997 - 2002

	Average Basis ($/bu)		Average Change in Basis ($/bu)
Crop and Market Area	**1997 - 1999**	**2000 - 2002**	
Corn			
Western	$0.32	$0.23	-$0.09
Central	$0.14	$0.04	-$0.10
Eastern	$0.15	$0.08	-$0.07
Soybeans			
Western	-$0.29	-$0.20	+$0.09
Central	-$0.08	-$0.06	+$0.02
Eastern	-$0.16	-$0.23	-$0.07

North Carolina—Basis Trends by Season

Corn. Seasonal trends in cash corn basis were similar across the three market areas, with the lowest prices occurring during the harvest in September (Figure 2-6). The western and eastern areas have the most similar seasonal pattern, although the west has a consistently stronger basis throughout the year by approximately 20 cents. In western and eastern North Carolina, basis strengthens quite consistently up until February. Then it takes a slight downward turn before significantly weakening in August. In central North Carolina, the trend is slightly different, particularly after the September low. Corn basis strengthens here in October but then weakens for the remainder of the calendar year. Some strengthening occurs in January through February before a leveling off until August, when it weakens significantly. Finally, corn basis levels for western and eastern North Carolina display large and similar ranges whereas those for the central area have a smaller range over the calendar year.

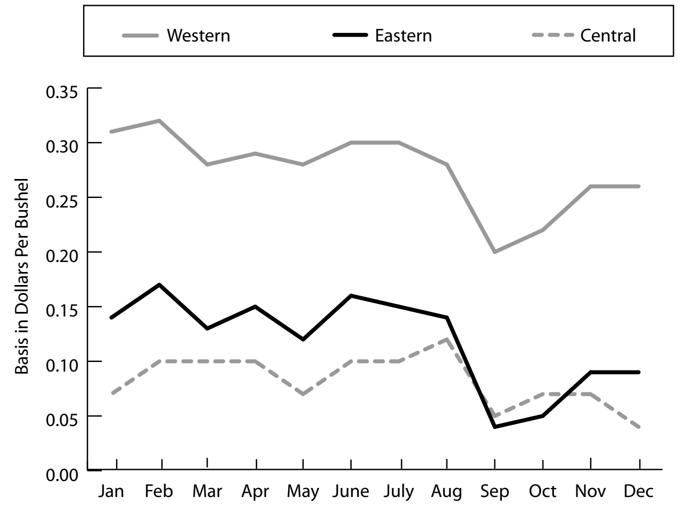


Figure 2-6. North Carolina corn basis—monthly average by market area, 1997 – 2002.

Soybeans. Soybean basis in North Carolina follows a different seasonal pattern than corn basis with more variation among market areas (Figure 2-7). Basis is distinctly different for the central area, compared to the western and eastern areas. The state's two largest soybean-crushing facilities are located within the central area, where basis is consistently stronger by about 10 to 15 cents than it is in the western and eastern areas. Most of the soybeans produced in the western and eastern areas are transported to central North Carolina to be crushed. Soybean basis weakens in all three areas to its lowest point in November around harvest. In the central area, basis strengthens consistently and gradually after harvest up through June. From June on through September, soybean basis in the central area strengthens even more significantly, increasing about 18 cents before weakening dramatically from September to November. A similar seasonal pattern occurs for the western and eastern regions with a gradual strengthening through June to a prominent peak in July. Basis then weakens through the remaining months until its low in November.

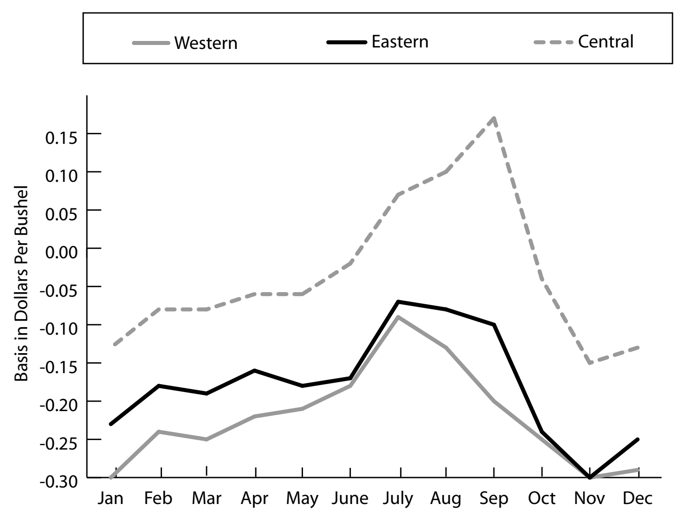


Figure 2-7. North Carolina soybean basis—monthly average by market area, 1997-2002.

South Carolina

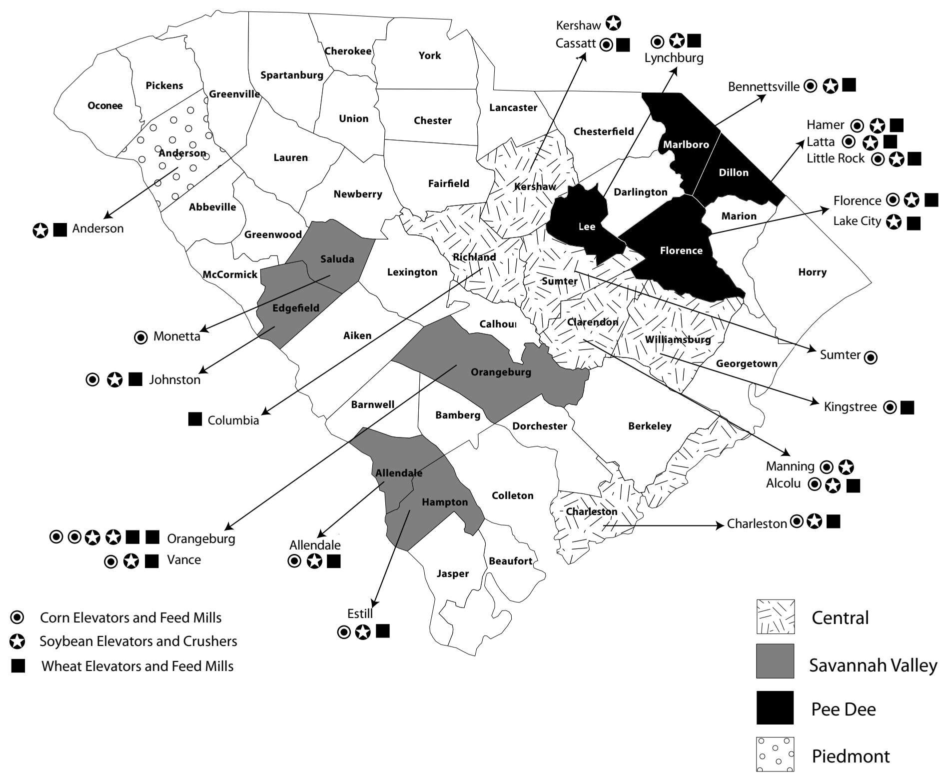
South Carolina exists in a regional market and sees transshipments of grain and soybeans to and from Georgia and North Carolina. It's especially important to consider regional data when analyzing trends here. The regional view is dramatic. As noted in the tri-state regional analysis at the beginning of this chapter, planted cotton acreage increased 276 percent from 1990 to 2002, while corn acreage declined 36 percent, soybean 37 percent, and wheat 27 percent (Table 2-1).

With that in mind, note that South Carolina cotton acreage also increased markedly—from 155,000 planted acres in 1990 to 290,000 planted acres in 2002. Meanwhile, planted acreages of corn, soybeans, and wheat declined 18 percent, 47 percent, and 48 percent, respectively. With fewer bushels of grain and soybeans flowing through the markets, many rural grain-handling points have closed.

Hog production declined 27 percent in South Carolina from 1990 to 2002 as regulatory efforts stifled development of large integrated units. Similarly, dairy and layer production declined. However, the state's turkey and broiler production expanded, North Carolina's hog industry expanded, and Georgia poultry production increased just across the state's borders. Grain demand declined slightly from 1997 to 2002, with a decline of 2 percent across the region and in South Carolina (Table 2-2). This may help to explain the general weakening of the South Carolina corn basis during that time.

Estimated feed grain use in South Carolina for 2002 was approximately 60 million bushels per year. Wheat and corn production in 2002 was 7 and 12 million bushels, respectively, which is 33 percent of use or a 118-day supply. Much of South Carolina's wheat crop now finds its way into feed use, as it does across the tri-state region. This may help to explain why wheat basis has declined less than corn and soybean basis.

Note that basis in the central market area of South Carolina is generally higher than elsewhere in the state (Figures 2-9, 2-10, and 2-11). Most of the state's end-user buying sites are located in the central area: a crushing facility, two feed mills, a food wheat mill, and the export elevator. The



Tracking Basis—
South Carolina, 1990–2002

- A dramatic shift to cotton
- Declining hog production
- Expanding turkey and broiler production
- Declining grain demand

Figure 2-8. Corn, soybean, and wheat market areas in South Carolina.

piedmont area, however, has only one elevator in Anderson that is a local buying station for wheat and soybeans. This elevator does not issue formal bids for corn and may not issue bids on wheat or soybeans for part of the year.

South Carolina—Basis Trends by Market Area

Corn. South Carolina's cash corn basis weakened in all of the state's market areas from 1997 through 2002 (Table 2-6), although a severe drought in the late 1990s may have influenced a stronger basis from 1997 through 1999. For example, during that three-year period in the Pee Dee area, the average cash corn basis was minus 3 cents. Over the next three-year period, 2000 through 2002, the basis weakened to an annual average of minus 15 cents—a decline of 12 cents.

The impact on cash corn basis in other areas of South Carolina is similar but less dramatic. In the central area, the basis declined 7 cents, and in the Savannah Valley area, it weakened by 8 cents.

Soybeans. Cash soybean prices in South Carolina, which were already well below futures contract prices in most markets, weakened further from 1997 through 2002 (Table 2-6). In the Pee Dee area, an average cash soybean basis of minus 18 cents during the 1997 through 1999 marketing period declined by 14 cents to minus 32 cents in 2002. Both the central and piedmont areas likewise experienced 14-cent declines in basis. In the Savannah Valley area, cash soybean basis also declined but not as dramatically. There the decline amounted to 3 cents. Much of this weakening may have resulted from the temporary closing of one of the state's two soybean crushing facilities. As mentioned above in the Georgia discussion, the facility at Estill in Hampton County closed for about 18 months but re-opened in 2002 under the name of Carolina Soya.

Wheat. The cash wheat basis strengthened slightly in the piedmont and Savannah Valley market areas from 1997 through 2002 (Table 2-6). The Pee Dee area remained essentially unchanged with a 1-cent decline. This stability may be attributed, in part, to the increased use of wheat as a feed grain for hogs and poultry—livestock that can use wheat as a portion of their rations. Wheat harvest occurs when local corn supplies are exhausted, and this may encourage feed use of wheat. Many buyers

Table 2-6. South Carolina Grain Basis by Market Area: 1997 - 2002

	Average Basis ($/bu)		Average
Crop and Market Area	1997 - 1999	2000 - 2002	Change in Basis ($/bu)
Corn			
Central	$0.13	$0.06	-$0.07
Pee Dee	-$0.03	-$0.15	-$0.12
Piedmont	-$0.07	-$0.15	-$0.08
Savannah Valley	$0.08	-$0.02	-$0.10
Soybeans			
Central	$0.01	-$0.13	-$0.14
Pee Dee	-$0.18	-$0.32	-$0.14
Piedmont	-$0.29	-$0.45	-$0.16
Savannah Valley	-$0.23	-$0.26	-$0.03
Wheat			
Central	-$0.11	-$0.26	-$0.15
Pee Dee	-$0.50	-$0.51	-$0.01
Piedmont	-$0.55	-$0.51	+$0.04
Savannah Valley	-$0.53	-$0.51	+$0.02

have been offering contracts for wheat at the July spot-corn price in recent years. The central area experienced the greatest weakening in basis with a 15-cent decline, principally due to reduced exports from the area's Charleston port facility.

South Carolina—Basis Trends by Season

Corn. The seasonal trends in South Carolina corn basis show similar general trends in all market areas (Figure 2-9). Corn basis is weakest during the harvest, from August through October. It then strengthens into late fall or early winter, reaches a maximum during the late winter months or early spring, and holds fairly steady during the summer. A notable spike occurs in June as most available local supplies have long since been exhausted. Wheat finds its way into feed channels during this time. The corn basis then weakens dramatically from June into the new crop harvest period.

Soybeans. The seasonal trends in South Carolina soybean basis demonstrate a preharvest pattern similar to that of corn: a substantial weakening prior to harvest and a low point at harvest during October to November (Figure 2-10). Soybean basis, however, is much less variable from harvest through early summer. It typically is fairly steady during the first half of the calendar year before beginning to strengthen during late summer. It is the strongest during July and August when local supplies are shortest and decreases steadily from then to the end of the calendar year, with the exception of the Piedmont area.

Wheat. South Carolina wheat basis (Figure 2-11) follows a mildly declining trend during the first nine months of the year. A notable weakening occurs in September. Wheat basis then strengthens until November before it begins to weaken. Note that the average basis in the central area is considerably higher than in the other market areas, primarily due to the location of a food wheat mill in Columbia and the port in Charleston.

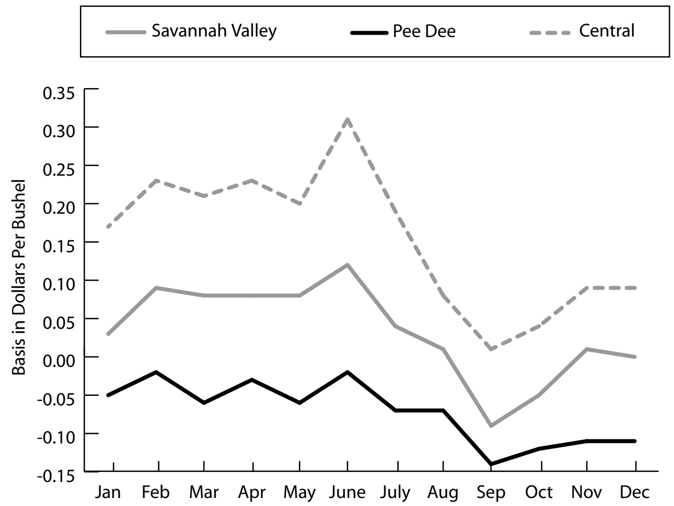


Figure 2-9. South Carolina corn basis—monthly average by market area, 1997 – 2002.

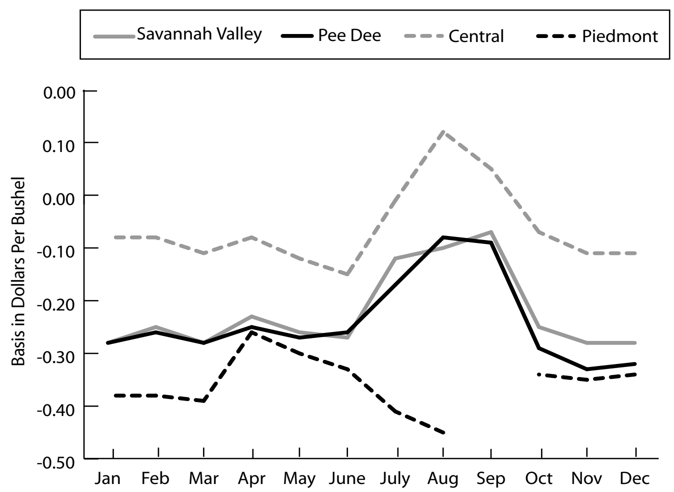


Figure 2-10. South Carolina soybean basis—monthly average by market area, 1997 - 2002.

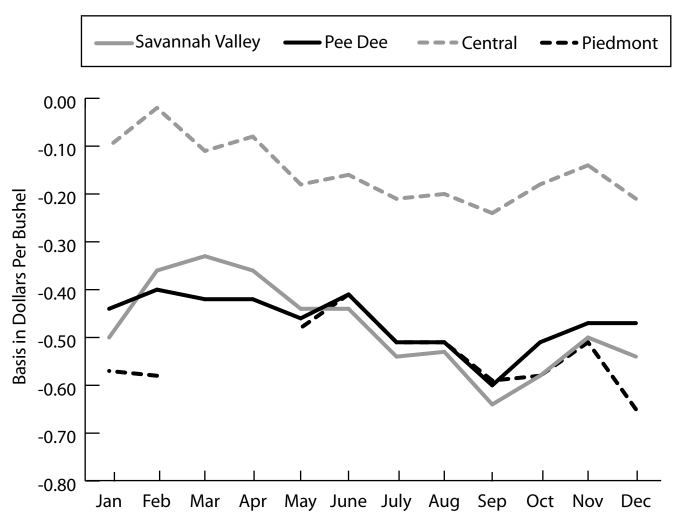


Figure 2-11. South Carolina wheat basis—monthly average by market area, 1997 – 2002.

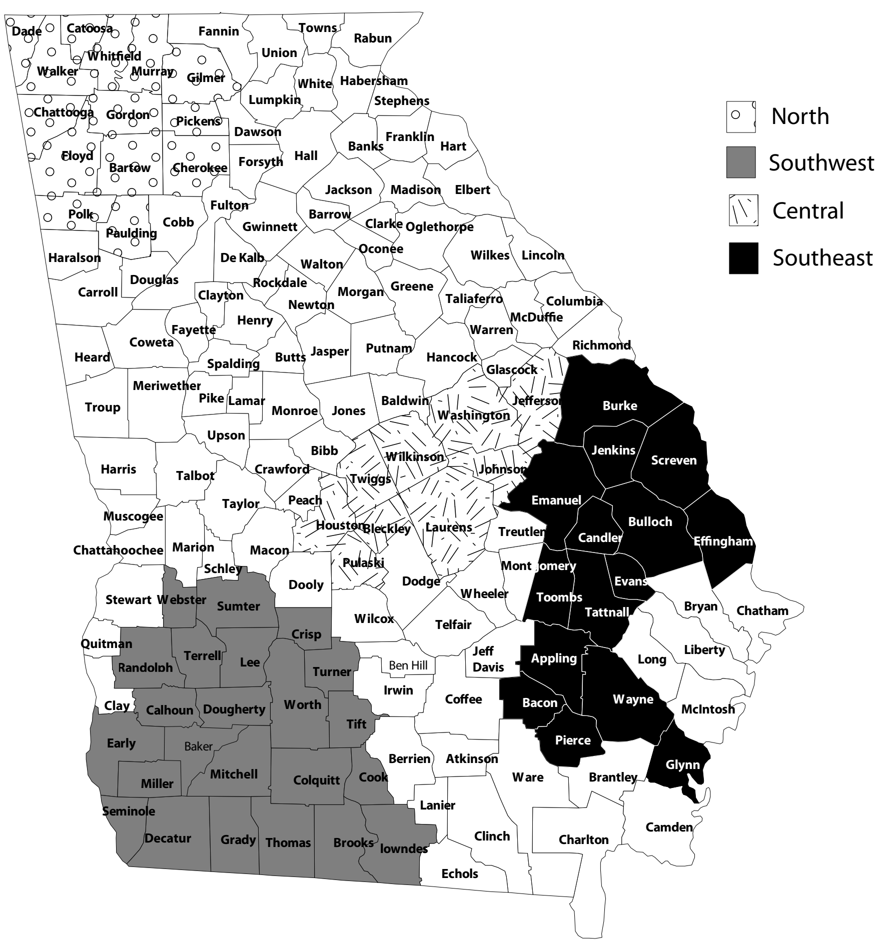
Georgia

Several structural changes in Georgia's economy have altered both grain and soybean basis in each of the state's four grain marketing areas (Figure 2-1). The most important factor has been the shift in cropping patterns.

Over the past decade, Georgia producers have reduced grain and soybean acreage and increased cotton production. Between 1990 and 2002, Georgia cotton acreage increased from 355,000 acres to 1.45 million acres. During the same period, the combined planted acreage of corn, soybeans, and wheat dropped by nearly half, from 1.95 million acres to 850,000 acres. With fewer bushels of grain and soybeans flowing through local markets, many county grain-handling points have closed. Theory would indicate that the loss of buying competition in Georgia should weaken the overall grain basis. As will be pointed out later, Georgia grain basis generally has weakened during the study period consistent with this theory.

The ports of Savannah, Georgia, and Charleston, South Carolina, also experienced closings of grain handling facilities. The resulting loss of competition among buyers has weakened overall grain basis in Georgia. Likewise, the loss of slaughter facilities in Georgia has decreased demand for local grains, especially corn and soybeans. This loss of demand for local grains has weakened grain basis.

With the decline in Georgia corn production, poultry feed mills have become increasingly dependent on corn railed in from the Midwest and the Corn Belt. Recognizing a market opportunity, railroad companies have introduced fast load-and-unload facilities. This equipment lessens demurrage (the time rail cars sit idle) and saves money for feed mills as they avoid demurrage. In return for the fast unloading equipment provided by the rail



Tracking Basis—Georgia 1997 – 2002

- A shift from grain and soybeans to cotton
- Loss of export terminals for grains
- Loss of slaughter facilities for hogs
- Changes in purchasing by poultry feed mills

Figure 2-1. Corn, soybean, and wheat market areas in Georgia.

companies, feed mills are required to purchase a large percentage of their grain—sometimes as much as 95 percent— from suppliers served by the rail line. This has further decreased demand for local grains by mills and thus weakened local grain basis. In essence, these rail contracts dictate a reduced demand for local grain and an increased demand for grain produced elsewhere, thereby eroding the viability of some local markets.

Georgia—Basis Trends by Market Area

Corn. Georgia corn basis weakened in all market areas from 1997 through 2002 (Table 2-4). In southeast Georgia from 1997 through 1999, basis was 13 cents. But during the next three years, from 2000 through 2002, the price weakened to an average of 8 cents under the nearby futures contract, which means basis was minus 8 cents, a decline of 21 cents per bushel on corn sold during the period.

The other market areas experienced similar declines in cash corn basis, with central Georgia experiencing the next steepest drop—16 cents. In north and southwest Georgia, cash corn basis weakened, but to a lesser degree. Both of these areas have large integrated poultry operations with captive feed mills that are the dominant purchasers of corn.

Soybeans. Although soybean cash basis declined much the same as corn cash basis in southeast Georgia, other market areas experienced a general but slight strengthening of the basis (Table 2-4).

In southeast Georgia, the temporary closing of the closest soybean processing facility in South Carolina, a major buyer in the area, may have caused much of the weakening. The facility was closed for about 18 months during 2000 and into 2002, although the buyer re-opened as Carolina Soya in 2002. The average basis during the downtime was the region's weakest over the six-year period.

In central Georgia, a region without a major soybean processor, the cash soybean basis strengthened slightly. Likewise, in both southwest and north Georgia, the cash soybean basis strengthened. Both areas contain major soybean processors: ADM in the southwest and Cargill in the north. In north Georgia, where cash soybean basis was lowest, basis gained an average of 7 cents. In southwest Georgia, it strengthened by 3 cents.

Table 2-4. Georgia Grain Basis by Market Area: 1997 - 2002

	Average Basis ($/bu)		Average
Crop and Market Area	**1997 - 1999**	**2000 - 2002**	**Change in Basis ($/bu)**
Corn			
Southeast	0.13	-0.08	-0.21
Southwest	0.16	0.10	-0.06
Central	0.09	-0.07	-0.16
North	0.12	0.08	-0.04
Soybeans			
Southeast	-0.24	-0.36	-0.12
Southwest	-0.37	-0.34	+0.03
Central	-0.32	-0.27	+0.05
North	-0.46	-0.39	+0.07
Wheat			
Southeast	-0.22	-0.44	-0.12
Southwest	-0.22	-0.40	-0.18
Central	-0.39	-0.44	-0.05
North	-0.36	-0.33	+0.03

Wheat. The cash wheat basis weakened in three of the four marketing areas during the six-year period (Table 2-4). The greatest weakening occurred in southwest Georgia, where wheat basis dropped from an average of minus 22 cents during 1997 through 1999 to an average of minus 44 cents during 2000 through 2002. In central and southeast Georgia, the cash wheat basis weakened as well, but to a lesser degree, with average declines of 5 and 12 cents respectively. In north Georgia, the basis strengthened slightly by an average of 3 cents.

Georgia—Basis Trends by Season

Corn. The seasonal trends in Georgia cash corn basis generally are similar in all four market areas, with some variations (Figure 2-2). Typically, basis is weakest during the harvest, August through October. It generally strengthens following harvest into late fall or early winter, reaching a maximum during the late winter months or early spring and holding fairly steady into summer. The basis then weakens dramatically around June and July as the new crop harvest begins.

Soybeans. In contrast, soybean basis does not show a clear weakening trend during the October-to-November harvest, and it is much less variable across market areas, with the exception of north Georgia during April (Figure 2-3). The cash soybean basis is typically weakest during July and August, with steady increases from then to the end of the calendar year. Typically, it is fairly steady during the first half of the calendar year before beginning to weaken during late summer. There is no clear or apparent explanation for the sharp drop in soybean basis during April in north Georgia.

Wheat. Seasonal trends in cash wheat basis (Figure 2-4) are quite variable across market areas. The southeast and southwest markets show considerable variation throughout the year, while the north and central markets show less variation.

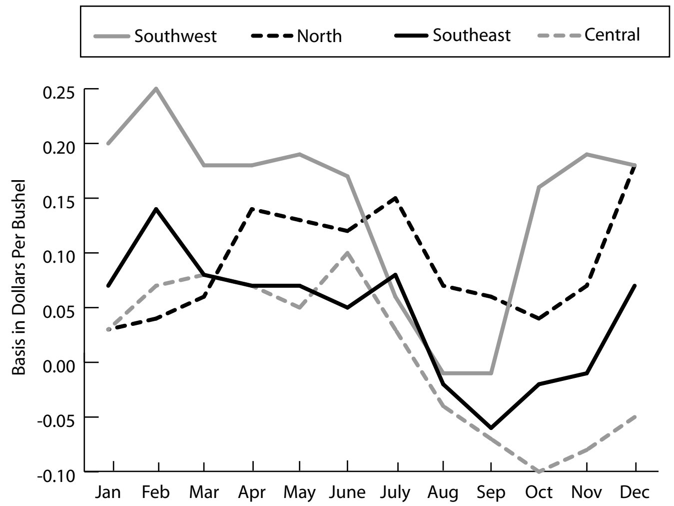


Figure 2-2. Georgia corn basis—monthly average by market area, 1997-2002.

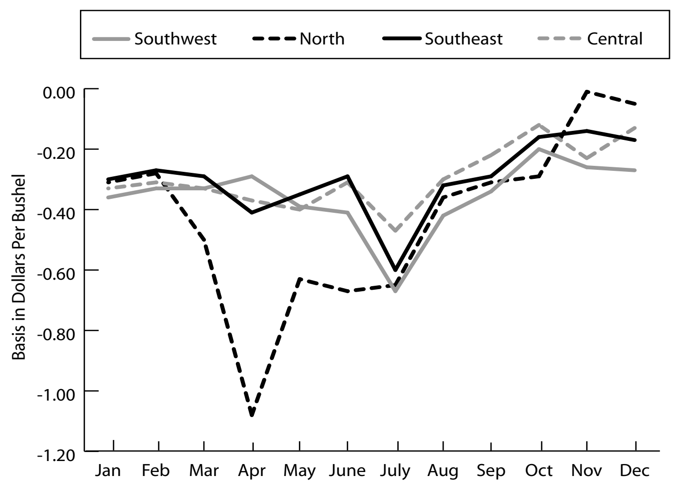


Figure 2-3. Georgia soybean basis—monthly average by market area, 1997-2002.

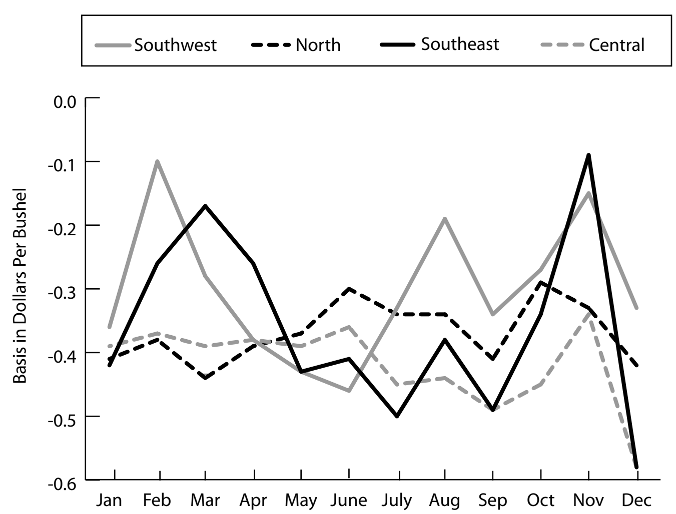


Figure 2-4. Georgia wheat basis—monthly average by market area, 1997-2002.

Comparing Seasonal Basis: Lessons Learned

What can we learn from comparing seasonal basis trends across the three states in similar geographic areas? Compare the corn basis in the eastern area of each state along the coastal plain (Figure 2-12). The seasonal patterns in North Carolina and South Carolina are similar, even though the corn basis in the Pee Dee region of South Carolina is negative throughout the year while the corn basis in North Carolina is positive throughout the year. In Georgia, however, the basis is generally positive but weakens during the harvest period of August and September.

Another striking feature is the magnitude of the difference among the states' market areas. Perhaps that can be explained by livestock production. North Carolina has its hogs located heavily in the eastern areas, and that added demand is strong. Georgia has considerable poultry production in the southeast to add demand. South Carolina has fewer total GCAUs than the other two states (Table 2-2), and thus local demand may well be weaker there than in the other two states. In the Pee Dee area of South Carolina, the buyers are local elevators who probably move most corn to eastern North Carolina. The basis difference may reflect transportation costs to North Carolina. The similarity in seasonal patterns and the fairly constant differential among these regions supports this view.

LESSON

Local end use demand is a strong influence on basis within any given market area. When local end use demand is high relative to supply, the basis tends to be relatively strong. When local end use demand is low relative to supply, the basis tends to be weak.

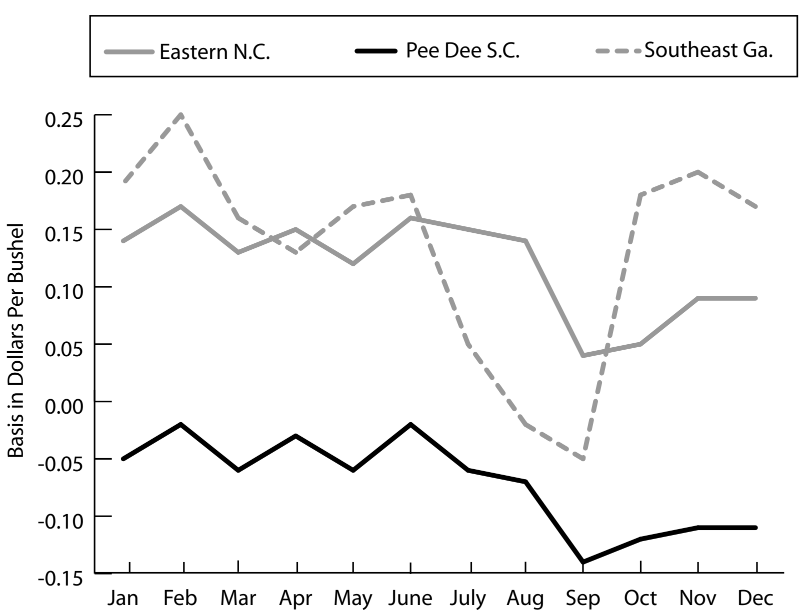


Figure 2-12. Tri-state average corn basis—eastern market areas, 1997-2002.

Now compare the seasonal trends in soybean basis for the central areas of the three states (Figure 2-13). The trends in soybean basis are quite similar for North and South Carolina, with stability during the first five months of the year, a general strengthening during the summer, and a weakening into the harvest. The central area in Georgia demonstrates a general weakening from January through May, a slight rise in June, and a strong dip in July, when a significant strengthening emerges into the harvest. The weakening of the basis at harvest in Georgia is much less than it is in the other two states.

Transportation costs could affect the basis. For instance, the basis in Georgia is significantly weaker than in the other two states. The central areas in both North and South Carolina were close to processors during 1997 through 2002, and thus the costs of transportation from the field to the mill were less there than in Georgia. Fields in central Georgia are 125 to 175 miles from the nearest processor. The added transportation cost could account for the lower basis in Georgia.

The central market areas of Georgia and South Carolina contain the major wheat mills in the two states, and the major production areas are reasonably close to the mills. Although the overall annual basis pattern is similar in the two states, the basis is much stronger in South Carolina than in Georgia (Figure 2-14). This disparity might be explained by the source of the basis data. In Georgia, the basis represents the average reported at rural buying points or first handlers (grain elevators). In South Carolina, however, the basis represents the average reported mostly at feed mills or end users. The basis is normally weaker at the first handler point than at the final user level.

LESSON

Basis will be stronger at the end user-processor location than at an intermediary handler location. Intermediary handlers must reduce their bids below the final use price level to cover operating costs, including a profit and transportation costs from the buying points to the end users.

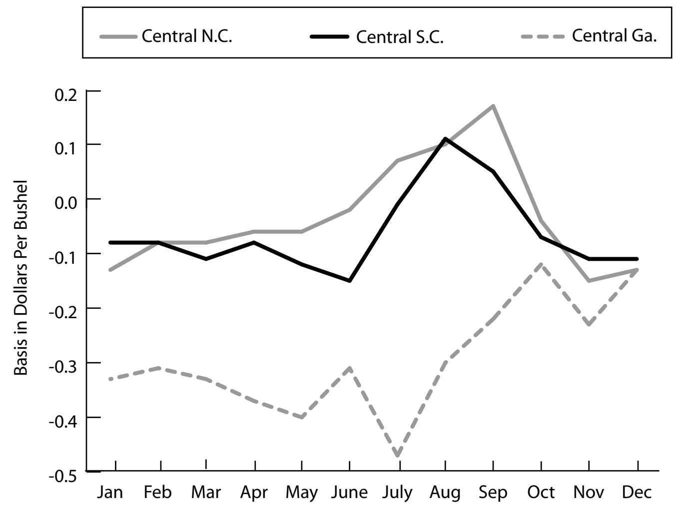


Figure 2-13. Tri-state average soybean basis—central market areas, 1997-2002.

LESSON

Transportation costs from the production areas to the end user can be a significant factor in determining basis.

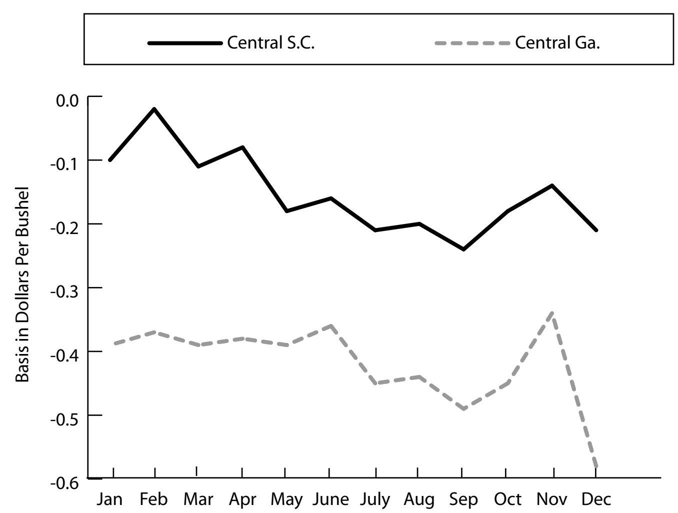


Figure 2-14. Two-state average wheat basis—central market areas, 1997-2002.

Across the Region: Key Points

Grain production and consumption patterns across the three states have many similarities. But significant variations among the states mean that information about the basis for a crop in one state cannot be safely transferred to another. The following key points, however, can be established:

- Georgia and South Carolina have large poultry industries as their demand base whereas North Carolina has a large and mature hog industry and an expanding broiler industry as its demand base.

- Corn basis weakened across the tri-state region but most dramatically in Georgia. The weakening of the corn basis varied from 4 to 21 cents in Georgia. The weakening in corn basis was less dramatic in North Carolina, with a weakening of 7 to 10 cents. A similar decline of 7 to 12 cents occurred in South Carolina.

- Soybean basis strengthened in North Carolina and Georgia and declined in South Carolina, with the decline in soybean-crushing capacity having an overriding weakening impact on statewide soybean basis. Considerable variation in soybean basis occurred within the market areas of both North Carolina and Georgia. Both strengthening and weakening occurred, with a common factor: basis weakened in market areas that lost soybean-crushing capacity. For southeast Georgia, this was the closing of the Estill, South Carolina crushing plant; for eastern North Carolina, it was the closing of the Cofield, North Carolina plant. The strengthening of the soybean basis in other market areas varied from 3 to 7 cents in Georgia and from 2 to 9 cents in North Carolina. In South Carolina, however, little variation occurred among market areas. Except for the Savannah Valley, all market areas experienced a consistent weakening of soybean basis.

- In the market areas of North Carolina and Georgia where crushing capacity remained the same, soybean basis strengthened overall. With declining supplies of soybeans and corn in the Southeast, soybean basis has fared better than corn. Soybeans grown in the Southeast have higher protein content than those grown in the Midwest, which makes them more desirable for crushing. Southeast corn, however, is often considered inferior to Midwest corn due to occasional incidences of aflatoxin, which renders corn unusable for most feed uses.

- Wheat basis varied across market areas in Georgia and South Carolina, declining up to 18 cents or modestly increasing up to 4 cents. The predominant production areas of both states experienced a weakening in basis that can be attributed to the closing of export facilities in Savannah and Charleston. Feed use has probably provided an offsetting influence in some market areas.

In the next chapter, we explain how growers can use this history of basis to determine when and where marketing conditions are likely to be most favorable, and which marketing strategies might be most profitable in a particular situation. By combining this information about basis trends with knowledge about recent Farm Bill provisions, a grower can maximize profits and reduce price risk.

Chapter 3. Using Historical Basis To Manage Price Risk

Our account of basis trends and patterns in Chapter 2 provided historical basis data for grains and soybeans in the tri-state region from 1997 through 2002. These kinds of historical data can help us to put current price levels into perspective. Sellers can use these data to see how current price levels compare to those in previous years and to detect seasonal trends in price levels. Because basis levels tend to be more predictable than general price levels, historical basis data are especially informative. Knowing the historical basis and its typical patterns throughout a marketing year can help producers determine when and where to sell their crops, and, in particular, it can help them to evaluate cash bids.

Basis and Marketing: The Basics

Futures market prices provide measures of the expected levels of supply and demand for a product at different times in the future. Most of the major grain players in the world markets pay significant attention to the Chicago Board of Trade and also utilize this market to manage price risk. The higher the futures price, the more expected demand there is for the product relative to expected supply. Conversely, when futures prices are low, expected supply is greater relative to expected demand.

The futures contract closest to expiration is often referred to as the nearby futures contract. We can think of the nearby contract as a measure of the current demand and supply situation in U.S. and world markets. Similarly, the basis serves that same function for local cash markets compared to the national market. When current basis is relatively strong, it implies that current

MARKETING OPTIONS

A ***cash contract*** is the most direct way to market a crop. A seller agrees to deliver immediately a specific grade and quantity of a crop to a designated location for an agreed-upon price. The contract is fulfilled when the seller delivers the product and the buyer pays the seller. This kind of contract is also known as a ***cash spot contract*** or a ***cash bid.***

A ***forward contract*** is made when two parties agree to a transaction in the future. The seller promises the buyer that he or she will deliver a specific grade and quantity of a crop at a designated time for the agreed-upon price. The buyer and the seller determine the contract terms; the buyer expects delivery of the product, and the seller must deliver. This kind of contract is also known as a ***forward price contract*** or a ***forward cash contract***. The price for the crop is locked in by the contract and is not affected by market changes in either direction.

A ***basis contract*** also is made when two parties agree to a transaction in the future. As in a forward contract, the seller agrees to deliver a specific grade and quantity of a crop at a designated time. The price to be paid at delivery, however, will be based on the nearby futures price in effect at delivery plus a basis amount specified in the contract. The basis amount used to calculate the price for the crop is locked in by the contract, but the actual price remains open to market changes due to changes in the futures contract specified in the contract.

A ***futures contract*** is similar to a forward contract, but it rarely involves the actual delivery of a product. A futures contract is traded on an exchange, and it involves standard terms determined by the exchange—the amount of the product to be delivered, the delivery months and locations, acceptable qualities or grades, and the last trading day. A seller's obligation can be extinguished by buying back the contracts sold.

A ***put option***, like a futures contract, is traded on an exchange. The option holder pays for the right to sell a given amount of a commodity to the option writer within a specified time period and for a set price, the ***strike***. Neither party has to take action to extinguish the contract. If the transaction does not occur within the specified time period, the contract automatically expires.

local demand is high relative to supply. Likewise, when current basis is weak, it implies local demand is low compared to supply. The terms *weak* and *strong*, when used to describe basis levels, are relative terms: a weak basis is one that is below typical historical levels, and a strong basis is one that is above typical historical levels.

Using Basis To Evaluate Cash Bids

We can use historical basis data as a measuring stick: we need only compare the current basis to historical levels to decide if the current basis is stronger or weaker than usual at any time. This comparison is especially useful in evaluating cash bids.

Buyers use the nearby futures price and adjust it to their local situation to arrive at their cash bids to sellers. As noted in Chapter 1, that adjustment is the basis. Sellers can determine the current basis provided by any bid and compare it to the historical basis by using this formula:

Current Cash Price = Current Nearby Futures Price + Historical Basis

Assuming there are no major changes in the market environment, a basis stronger than the historical basis in a current cash bid would indicate a stronger desire from the buyer for the commodity than would normally be expected. That would be a signal that the current bid is a relatively attractive bid. Conversely, a weaker basis than the historical basis would indicate a weaker desire from the buyer for the commodity than would normally be expected. That would be a signal that the current bid is relatively unattractive.

EXAMPLE

In October, a corn buyer in southeast Georgia is offering a bid for immediate delivery. When the seller applies the formula noted above, he determines that the buyer's bid is the sum of the December futures price and a basis of 20 cents. To evaluate that bid, the seller compares that basis to the historical basis for October. Based on the historical basis data for 1997 through 2002, the basis in October for the Southeast region has been as high as 18 cents (2000) and as low as minus 20 cents (2002) based on the December nearby futures, and it has been an average of minus 3 cents (Table 3-1). The current bid calculated with a basis of 20 cents would represent a very strong bid compared to what might be expected; it would be an attractive bid to consider accepting. In fact, the current bid would set a new six-year high in basis for October. It implies that local demand for corn is relatively greater than local supply. If the bid offered was calculated with a basis of minus 15 cents, however, then that bid should be interpreted as a poor offer due to the weak basis; the seller might well wait until the basis is stronger to sell the grain or look elsewhere for a buyer. A weaker basis implies that available supply is relatively greater than local demand.

LESSON

Basis can be used to decide whether it is beneficial to accept an offered cash price at any time. If the cash bid includes a basis amount that is strong relative to history, then the bid is attractive and indicates a strong desire by the purchaser to buy and a good opportunity for the seller to sell. The converse is also true. By knowing what the basis has been in the past, the seller can decide with greater confidence whether an offer is reasonable.

Table 3-1. Average Monthly Corn Basis Using Nearby Futures for Southeast Georgia

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1997	0.33	0.32	0.28	0.09	0.27	0.25	0.11	0.01	-0.04	0.03	0.08	0.04
1998	0.11	0.15	0.11	0.15	0.15	0.18	0.13	0.16	0.02	-0.01	0.13	0.15
1999	0.17	0.27	0.14	0.28	0.24	0.08	0.34	0	-0.27	-0.03	0.05	0.16
2000	0.05	0.08	0	0.01	0.02	0.06	-0.02	-0.10	-0.16	0.18	0.21	0.26
2001	-0.14	-0.09	-0.09	-0.11	-0.12	-0.10	-0.09	-0.12	-0.17	-0.16	-0.20	-0.22
2002	-0.20	0.05	-0.20	-0.20	-0.23	-0.20	-0.10	-0.18	-0.20	-0.20	-0.08	-0.13
Min.	-0.20	-0.09	-0.20	-0.20	-0.23	-0.20	-0.10	-0.18	-0.27	-0.20	-0.20	-0.22
Max.	0.33	0.32	0.28	0.28	0.27	0.25	0.34	0.16	0.02	0.18	0.21	0.26
Avg.	0.05	0.13	0.04	0.04	0.06	0.05	0.06	-0.04	-0.14	-0.03	0.03	0.04

Using Basis To Evaluate Forward Contracts for Harvest Delivery

As noted above, all cash pricing depends on the following relationship:

Cash Price Offer = Nearby Futures Price + Current Basis

Because of this fundamental relationship, we can use a similar calculation to evaluate forward contract offers on harvest delivery. All forward contract pricing is calculated using futures prices and estimates of basis levels for harvest delivery. Typically, we expect forward contract pricing for harvest delivery to closely follow this formula:

Forward Price Offer = Harvest Contract Futures Price + Historical Basis At Harvest

The harvest contract futures price plus the historical basis at harvest can be combined to project a forward contract price for delivery at harvest. We can compare this projected forward contract price with a forward contract offer to evaluate the attractiveness of the offer. Consider the typical harvest time for the region of interest, and use the futures contract that expires closest to, but not before, the typical harvest time. For corn that would be the December futures contract, for soybeans the November futures contract, and for wheat the July futures contracts. These are considered to be the harvest futures contracts.

EXAMPLE

Consider a soybean producer in Pasquotank County, North Carolina, who is interested in locking-in a price for soybeans in June for harvest delivery in late October. Let's say the November soybean futures contract, the futures contract that expires closest to but not before the time the producer is planning to sell the soybeans, is trading at $6.00 per bushel in June. The producer calls the local buyer at Elizabeth City (the closest local elevator), who makes a forward contract harvest delivery offer of $5.85. The local buyer's offer is 15 cents less than the current futures price. In other words, the basis is minus 15 cents. Is this a reasonable price? Should the producer contract some of the anticipated production at this price?

The historical basis can help the producer decide whether to accept or reject the offer (Table 3-2). The monthly historical basis data for Elizabeth City from 1997 through 2002 provide the average, minimum, and maximum values by month. Using this information, the producer can make a more informed decision about whether to accept the current offer of $5.85. Over this six-year history, the average basis in October at Elizabeth City has been minus 27 cents, with a high of minus 14 cents (1997) and a low of minus 37 cents (2002). If the buyer were to make an offer using the average basis, we would expect an offer of $5.73 ($6.00 + [-$0.27] = $5.73) but the current offer is 12 cents above this level ($5.85 - $5.73 = $0.12). In this case, the producer has an opportunity to lock in a basis that is significantly above the six-year average.

Assuming that the price level is also acceptable, the current offer gives the producer an opportunity to eliminate both price and basis risk on the amount of expected production that he decides to contract. He must be comfortable with the fact that entering into a forward contract precludes benefiting from

(continued)

Table 3-2. Average Monthly Soybean Basis Using Nearby Futures for Elizabeth City, N.C.

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1997	-0.20	-0.15	-0.17	-0.18	-0.16	-0.10	0.39	0.03	0.14	**-0.14**	-0.25	-0.17
1998	-0.10	-0.06	-0.06	-0.10	-0.11	-0.13	-0.36	-0.07	-0.16	**-0.20**	-0.29	-0.31
1999	-0.26	-0.26	-0.28	-0.25	-0.35	-0.35	-0.38	-0.29	-0.34	**-0.31**	-0.35	-0.21
2000	-0.25	-0.25	-0.30	-0.29	-0.34	-0.34	-0.05	-0.05	-0.25	**-0.36**	-0.51	-0.47
2001	-0.38	-0.24	-0.20	-0.17	-0.19	-0.18	-0.10	-0.09	-0.16	**-0.37**	-0.42	-0.31
2002	-0.24	-0.17	-0.18	-0.14	-0.13	-0.13	-0.02	0.15	0.10	**-0.21**	-0.25	-0.23
2003	-0.14	-0.09	-0.09	-0.12	-0.20							
Min.	-0.38	-0.26	-0.30	-0.29	-0.35	-0.35	-0.38	-0.29	-0.34	**-0.37**	-0.51	-0.47
Max.	-0.10	-0.06	-0.06	-0.10	-0.11	-0.10	0.39	0.15	0.14	**-0.14**	-0.25	-0.17
Avg.	-0.22	-0.17	-0.18	-0.18	-0.21	-0.21	-0.09	-0.05	-0.11	**-0.27**	-0.35	-0.28

any price rallies, or strengthening in basis, after the contract is made. If he is not comfortable with the price level, he might want to discuss the possibility of a basis contract. A basis contract allows the producer to lock in the current basis, but to determine the price level at a later date.

LESSON

Historical basis can be used to evaluate forward price contract offers. A stronger-than-expected basis in conjunction with an acceptable price level may signal an opportunity to eliminate price and basis risk by agreeing to a forward price contract. This strategy is advantageous in that it provides protection from any declines in price levels or weakening in basis. The primary disadvantage of this strategy is that it prevents benefiting from price rallies or strengthening in basis after the contract is made. There are production risks as well: the producer is under contract to deliver the amount of grain specified.

Using Basis in Deciding Whether To Hedge

It is essential to understand how local prices and basis have behaved historically for producers and others making decisions to reduce their exposure to price risk. As noted above, a forward contract eliminates price risk by locking in a price level. But it also eliminates price opportunity—the chance that prices or basis will strengthen after the contract is made. Producers can eliminate price risk and still take advantage of any strengthening in basis by hedging with a futures contract or put option.

By selling a futures contract for a commodity when the price is strong and buying back the contract when the price weakens, a producer achieves a gain from the transaction. That gain can be used to offset a lower price received from a cash bid or forward contract. This practice is known as *hedging*.

Basis risk must be significantly less than price risk for hedging to be attractive. Historical price and basis data establish whether this is indeed the case. To illustrate, let's say the current futures price of soybeans is $6.00 per bushel and that the historical basis has been minus 30 cents, yielding a local cash price of $5.70. If basis were to vary by 100 percent or 30 cents, a very wide swing by historical records, the local cash price would vary by 30 cents either way—from $5.40 to $6.00, depending on the direction of the basis change. But if the futures price were to change by only 10 percent or 60 cents, a less-than-average amount during a growing season, the local cash price would vary by 60 cents either way—from $5.10 to $6.30, a range of $1.20. Clearly, a small variation in futures price can cause local cash prices to change by a greater amount than a large variation in basis. This relationship is fundamental to hedging.

Another way a producer can establish a hedge against downward price movements is by buying put options. As noted earlier in this chapter, a put option is an asset that gives the option holder the right to sell a crop to the option writer at a specified price (the strike) up to a specified date. If the transaction does not occur within the specified time period, the option expires. This allows a seller to take a position in the market for a relatively small cost without buying and selling futures contracts. Hedging with put options will be discussed in Chapter 4.

Remember that the transaction costs associated with futures contracts and put options must be figured into the costs associated with hedging, but these are typically small relative to the value of the commodity being hedged.

Most of what has been described above can be characterized in Table 3-3 and Figure 3-1, which display the merits of risk management under alternative scenarios of basis and futures prices. Table 3-3 also shows the risks associated with different marketing strategies.

EXAMPLE

Return to the producer in Pasquotank County, North Carolina, who wants to lock in a price for his soybeans before harvest. By locking in before harvest, he can avoid the price lows that usually occur at harvest. Suppose now that the November futures contract trading at $6.00 in June has a harvest delivery offer of only $5.65, a basis of minus 35 cents ($5.65 - $6.00 = -$0.35). The six-year history of the October basis in Elizabeth City, North Carolina (Table 3-2), reveals that minus 35 cents is close to the record low (the lowest basis was minus 37 cents in 2002 versus a six-year average of minus 27 cents). Because the offered basis is weak, the producer probably should pass on this forward contract price offer. Without historical records, it would have been difficult to put the merits of the offer into perspective.

Despite the less-than-attractive basis offered, if the producer finds the current November futures price of $6.00 attractive, then an opportunity exists to lock in this price level. By hedging using a futures contract, the producer can lock in the attractive price level and still benefit from the likely improvement in basis that should occur later. (We can be fairly confident about this improvement due to our historical perspective on basis levels relative to the current offer.) The producer hedges by selling the appropriate number of futures contracts (an amount the producer is confident he will produce) and buying them back when he sells his crop on the cash market—offsetting.

Although he has locked in a price level by taking a position in the futures market , he still faces basis risk—the risk that basis will weaken further. However, the basis is already close to its historical low, so the producer may be willing to take on this risk because the historical records show that the basis should improve, which will work to his benefit. Once the crop is hedged, he can keep a close watch on basis activity. Should the basis strengthen, he can offset the futures hedge by pricing the soybeans through a forward contract (if it is still prior to harvest) or by accepting a cash bid at harvest. Either plan means the producer benefits from any improvement in basis, which would be more profitable than accepting the November forward contract being traded in June.

Let's say the November contract is trading at $5.75 in September and the forward contract harvest delivery price is $5.50: the basis offer for harvest delivery is now minus 25 cents. This basis is more like the average basis in October, which is minus 27 cents (Table 3-2). This offer represents an opportunity to lock in a reasonable basis, thus avoiding the possibility of a below-average basis at harvest. The producer locks in this basis by entering the September forward-price harvest-delivery contract, and he also locks in a price level. At this point, there is no longer any reason to continue with the price level protection offered by the hedge undertaken in June. Now the producer offsets his futures positions by buying the same number of futures contracts at $5.75 (as he sold at $6.00), which nets 25 cents per bushel on his futures position. In effect, the 25 cents gets added to his forward contract price. Thus, he received a net price of $5.75 for the soybeans that were marketed: ($5.50 + $0.25 = $5.75). Notice that this is 10 cents more than the $5.65 offered in June, an amount equal to the strengthening in basis between June and September.

Table 3-3. Marketing Strategies and Their Impact on Futures and Basis Risk for the Seller

Marketing Strategy	Futures Price Risk	Basis Risk
Cash Sale At Harvest	Yes	Yes
Cash Forward Contract	No	No
Basis Contract	Yes	No
Futures Hedge	No	Yes
Put Options Hedge	No	Yes

Figure 3-1 illustrates alternative strategies for different futures price and basis situations. Each of the strategies takes advantage of potential changes in either futures price or basis and protects the seller against adverse movements in those elements. The suggested strategies are the least risky marketing alternatives for each situation. For example, when the basis is strong and current futures prices are high, the best strategy with the least risk would be to enter into a forward contract. That contract locks in both the favorable basis and attractive futures price. It protects against a weakening of the basis and against futures prices falling.

LESSON

Basis can be used to decide whether it is beneficial to hedge or to accept a forward contract. A weaker-than-expected basis, in conjunction with an acceptable price level, may signal an opportunity to eliminate price risk by hedging and retaining only basis risk. This strategy lets the seller lock in the current price level but not the basis. Locking in the price level eliminates the more risky component (price), leaving the less risky and more predictable component (basis) to strengthen to its typical level. A stronger basis makes hedging less attractive (a weakening of basis is detrimental to a producer who has hedged) and signals that a forward contract may be more appropriate.

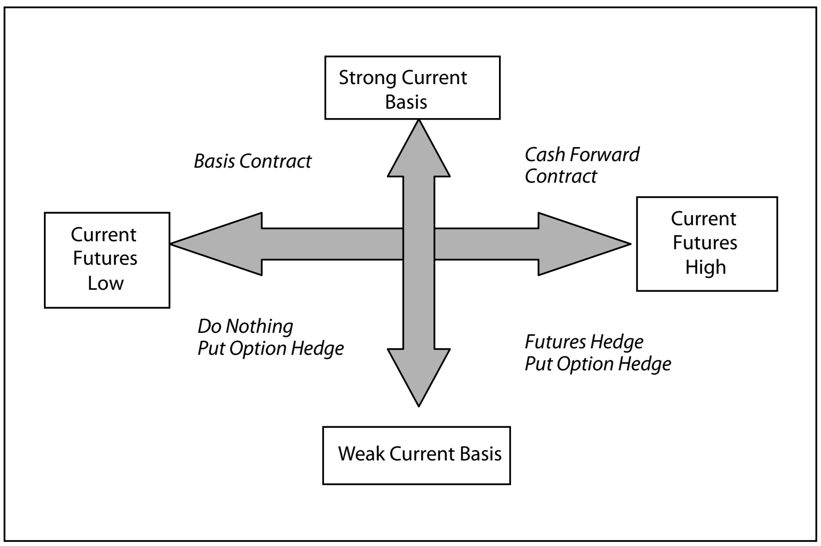


Figure 3-1. Alternative marketing strategies for different futures price and basis situations.

Using Basis in Deciding Whether To Store

We can also use historical basis to decide whether to store a commodity in anticipation of a higher price in the future. Storage is profitable when local cash prices strengthen enough to offset the costs of storing the commodity. Costs of on-farm storage consist of fixed costs—the storage facility, conditioning, and preservation—and the opportunity cost of the commodity's value. These monthly costs vary from farm to farm but may be nearly 5 cents per bushel for corn, 6 to 7 cents for wheat, and 8 to 9 cents for soybeans. Commercial storage costs may be more or less than on-farm costs. Local cash prices need to rise by more than these costs to make storage profitable.

When is it worthwhile to invest in on-farm storage facilities? If basis consistently strengthens enough to offset the cost of storage year after year, it may pay to invest in on-farm storage facilities. As we noted in Chapter 1, one goal of price-risk management is to avoid the typical price lows that come about when producers simply sell at the prevailing harvest price with no other marketing strategy.

Whether a producer uses on-farm or commercial facilities, storage incurs additional expenses, including shrinkage, interest, and cost of storage. Thus, ultimately, a significantly higher price is needed if storage is to be profitable. Storage also involves additional risks, such as possible spoilage, that must be considered. Local cash prices can change when futures market prices change, when buyers make changes in the basis, or when both changes occur. Historical basis data, which can depict seasonal movements in futures prices, can provide predictions of how the basis (and thus the cash price) is likely to change from one time to another.

When contemplating storage, a producer should consider the difference between the nearby futures and a deferred contract month as perhaps the best indicator of whether storage might be profitable. For example, if the November soybean contract is trading at $5.70 in October and the March contract is trading at $5.90, there is a price spread or carry of 20 cents. That is, the market is willing to pay 20 cents to store soybeans from November to March.

What does basis typically do between October and March? Using the producer selling soybeans in Elizabeth City as an example, let's take a look at basis in eastern North Carolina. Figure 2.8 in Chapter 2 revealed that typically basis is weakest around harvest when supplies are plentiful—October and November for eastern North Carolina. Thus, we can anticipate that the basis most likely will improve from November to April. Remember that the producer who owns soybeans benefits from a strengthening in basis. Thus, whether storage is beneficial depends on whether the strengthening in basis, combined with the carry that is being offered, is more than enough to cover the costs associated with storage. The return produced by storing the commodity can be expressed as follows:

Return to Storage = Futures Carry + Change in Basis – Cost of Storage

EXAMPLE

Let's return to our example of the producer in Pasquotank County, North Carolina. We assume the soybean futures are trading (as in the previous example), with a 20-cent carry being offered in October between November and March (the November contract is trading at $5.70 and the March contract at $5.90 in October). In addition, the current nearby basis is at the historical average of minus 30 cents, which results in a current local cash price of $5.40 ($5.70 + [-$0.30] = $5.40). The producer must decide whether to accept the current cash price of $5.40 or to store his soybeans in an effort to improve the net price. Knowing the historical basis is essential to making this decision: the profitability of storage hinges on the carry being offered plus the amount the basis is likely to strengthen from October to March. Historical data give some indication of what the basis gain might be.

Figure 2-8 in Chapter 2 plots the monthly average nearby basis for eastern North Carolina from 1997 through 2002. The specific data for Elizabeth City support the theory that the basis tends to be weakest in November (minus 35 cents) but improves through December (minus 28 cents), January (minus 22 cents) and February (minus 17 cents). If the basis follows typical historical levels and the producer defers selling his soybeans until March, he could benefit from 15 cents in strengthened basis (the average over the six-year history shown in Table 3-4), and he could capture the current carry of 20 cents. This means that a potential gain of 35 cents per bushel could be captured by storing soybeans from October through March. This potential benefit needs to be weighed against the costs of storage.

Storage costs depend on location (on-site or commercial) and other market factors. If we assume a storage cost of 8 cents per month per bushel, we can "pencil" a return of 3 cents per bushel for storing from November until March—the average gain in basis ($0.15) plus the current carry ($0.20) minus the storage costs ($0.32).

Table 3-4. Strengthening in Soybean Basis for Elizabeth City, N.C., 1997– 2002

Year	November	March	Strengthening
1997	-0.25	-0.17	0.08
1998	-0.29	-0.06	0.23
1999	-0.35	-0.28	0.07
2000	-0.51	-0.30	0.21
2001	-0.42	-0.20	0.22
2002	-0.25	-0.18	0.07
Average	-0.35	-0.20	0.15

Source: http://www.ag-econ.ncsu.edu/faculty/piggott/soy_dat_short.htm

Of course, the producer remains susceptible to both price and basis risk if he simply puts his soybeans in storage. Price risk can be managed by hedging—using a March futures contract to lock in the current carry being offered, which leaves only basis risk. A simple comparison of historical strengthening in basis between November and March (such as the one presented in Table 3-2) gives the producer some confidence in accepting this basis risk. Using our example of Elizabeth City, we see that the previous six years have seen a strengthening in basis by an average of 15 cents.

Seasonal Prices and Storage

Seasonal trends in futures prices can also be combined with historical basis to evaluate further whether one should store.

EXAMPLE

Consider a corn grower in southwest Georgia who harvests corn in September. Should he sell it at harvest or store it? In Chapter 2, Figure 2-2, we see that the basis in September has averaged minus 5 cents but strengthens to 25 cents in February—a 30-cent basis gain over the five-month period. If it costs 5 cents a month per bushel to store the corn, storage costs would be 25 cents per bushel for five months, and basis gain would provide a 5-cent return per bushel. Over that same period, we find that nearby futures prices also typically rise as well. In Figure 3-4, we see that the combined impact of basis gain and nearby futures prices seasonal movements indicate that local cash prices typically rise from $2.23 in September to $2.79 in February for a gain in the local cash price of 56 cents. Thus, this corn grower could "pencil in" a return on storage of 31 cents per bushel ($0.56 minus $0.25) versus selling at harvest.

LESSON

Basis can be used to decide whether it is beneficial to store for a deferred sale. Typically, basis is weakest at harvest, but a seller benefits when basis is strong. A basis that improves considerably after harvest, combined with an attractive spread between the nearby (harvest) futures and distant futures may signal an opportunity to benefit from storage. Although storage is costly and requires additional exposure to unfavorable price movements, some of this risk can be managed by hedging with futures (or put options) to lock in price levels. If the carry being offered is close to the cost of the storage, this can be captured with a hedge, allowing any strengthening in basis after harvest to be added to the net price. A historical basis that has behaved predictably can give producers additional confidence when making storage decisions. Of course, there are no guarantees.

Using Basis Data with Seasonal Price Trends

We compiled the data in this publication and the supplemental tables for an important reason: to inform producers about the relative cash market conditions they face in selling their crops. Knowing how the basis changes during the year provides key information about the local supply-and-demand conditions within a particular market area. With this information, a producer can evaluate different marketing strategies and develop pricing strategies that maximize crop income and manage price risk.

So far we've discussed using basis data to evaluate the following: cash bids, forward contract offers, hedging through futures contracts and put options, and storage. These data can be used in another way as well: by combining basis data with data about seasonal movements in futures prices, we can estimate seasonal cash prices. Of course, the underlying assumption is that current and future seasonal price trends will be similar to those of historical trends, barring any further structural changes in the market that might occur from year to year. Earlier we used simple formulas to show price relationships, and we can illustrate this concept with the following formula:

Adjusted seasonal cash price = Seasonal futures price tendencies + Seasonal basis tendencies

Thus, we can think of the adjusted seasonal cash price as a standard against which we can compare current prices.

Figures 3-2, 3-3, and 3-4 show the historical seasonal price movements of grain and soybeans in Georgia based on the nearby futures contracts for each commodity. To develop these seasonal tendencies, we took the average nearby futures contract price for each month of each year and divided that number by the average price for the entire year; then we multiplied by 100 to develop an annual index. These calculations were completed for the years 1997 through 2002, and those annual calculations were averaged to develop the seasonal price tendencies. The nearby contract was rolled over to the next month on the first trading day of the expiring contract. Prices on these figures above the 100 percent line indicate prices that tend to be above the season average, and, similarly, prices below the 100 percent line indicate prices below the season average.

The key fact to glean from these three figures is the tendency of futures prices to be above the annual average before the planting of the crop and to be below the average at harvest.

We can combine this price data with the seasonal basis data to derive localized cash price trends for each commodity. We could develop a localized cash price trend for each local market in the three states. For example, Figures 3-5, 3-6, and 3-7 show the combined seasonal trends— both futures prices and local basis—for corn, soybeans, and wheat in the Georgia markets.

We "fit" each figure with the average nearby futures price during the years 1997 through 2002 to depict historical cash price trends. By comparing the futures price trend in Figures 3-2, 3-3, and 3-4 with the combined adjusted local cash prices in Figures 3-5, 3-6, and 3-7, we can see that futures price movements are dominant in determining overall cash price trends. But we can also see that the basis trends exert an important but slightly weaker influence on local cash prices. For this reason, it is very important for producers to manage their exposure to futures price risk by using

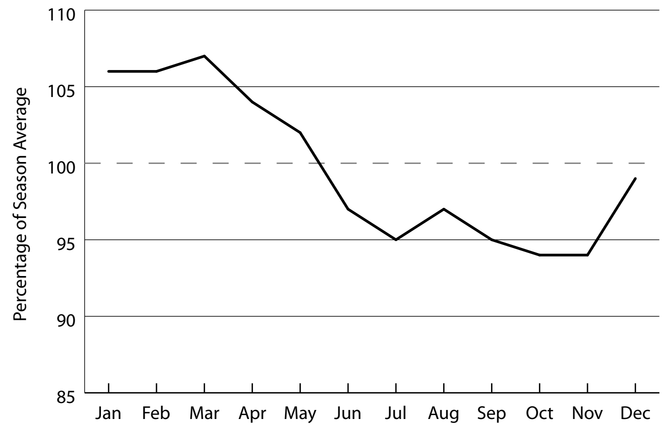


Figure 3-2. Georgia corn seasonal nearby futures tendencies, 1997 – 2002.

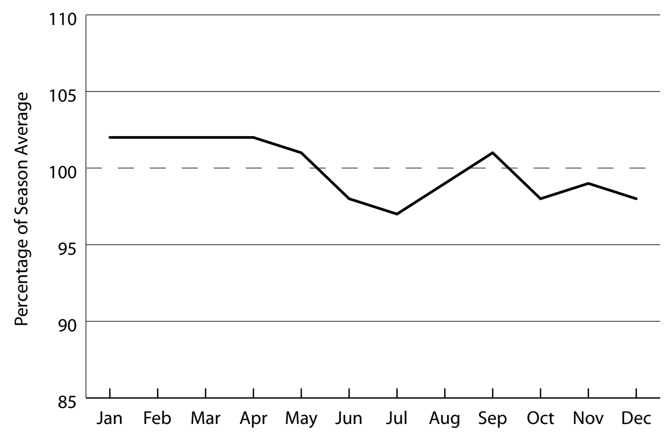


Figure 3-3. Georgia soybean seasonal nearby futures tendencies, 1997 – 2002.

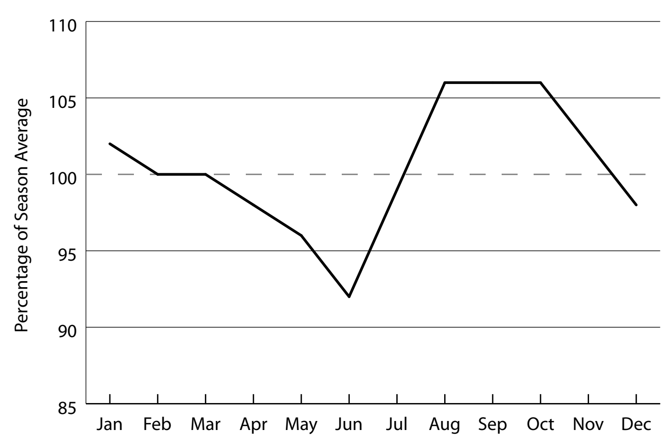


Figure 3-4. Georgia wheat seasonal nearby futures tendencies, 1997 – 2002.

either forward contracts, hedging in the futures markets, or purchasing put options. Figures 3-5, 3-6 and 3-7 also illustrate the crucial fact that futures price risk is far greater than basis risk.

Deciding When to Sell: Using Adjusted Seasonal Localized Prices

Close inspection of Figures 3-5, 3-6 and 3-7 provides insight into how local cash prices in Georgia might be expected to behave during the calendar year if we assume that prices in the future will tend to follow historical patterns. In the case of corn (Figure 3-5), we can see that the strongest prices typically occur during the first six months of the year and that prices tend to be weakest during July through November. In this situation, it would be beneficial to lock in a price on corn during the first half of the year and avoiding selling during July through November. Futures prices tend to be above the seasonal average early in the year, and the basis is also at its strongest early in the year, which makes local cash prices strong.

In the case of soybeans (Figure 3-6), we can see that local cash prices tend to be strongest during January through April and September through December and weakest during May through August. The north marketing area is an exception: an abnormal drop in basis occurs during April. Soybean futures tend to weaken during May through August, with a general weakening of the basis contributing to the decline during July. In this situation, it would be most profitable to lock in a price on soybeans either early or late in the year (if storage costs can be recouped) and to avoid pricing in May through September, especially in July.

In the case of wheat (Figure 3-7), local cash prices tend to be at their seasonal highs during the post harvest period (July through November) and weakest during the harvest (May and June). In this situation, it would be beneficial to lock in a price on the crop after harvest or to use a forward contract and lock in a price on the crop at or near planting time.

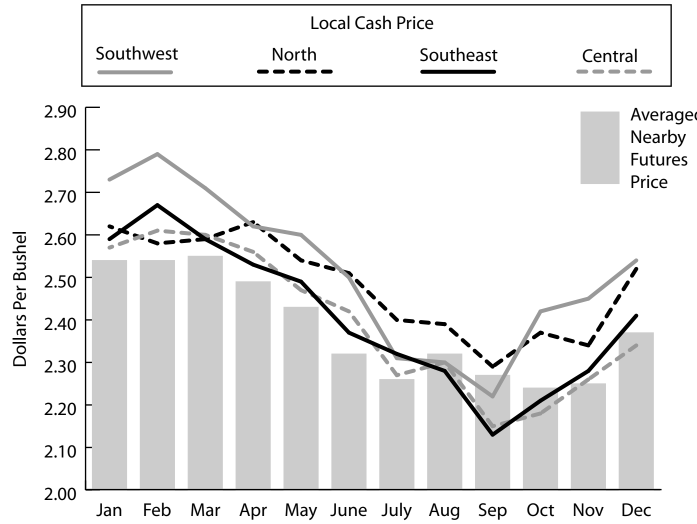


Figure 3-5. Adjusted seasonal local corn cash prices in Georgia compared to averaged nearby futures price.

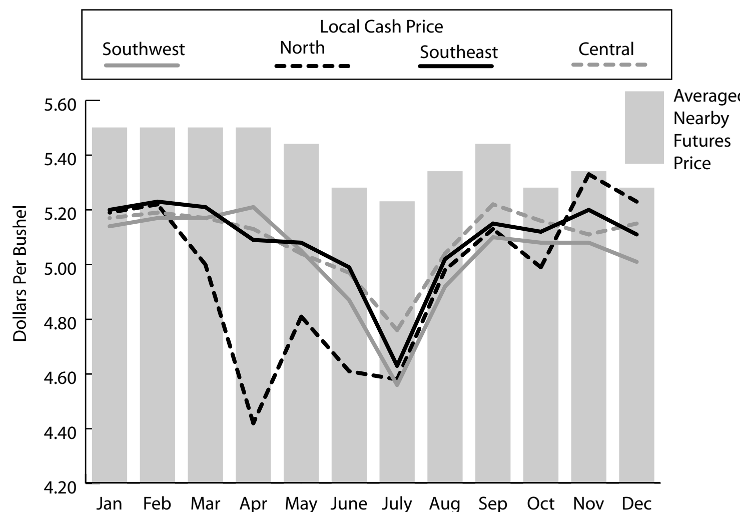


Figure 3-6. Adjusted seasonal local soybean cash prices in Georgia compared to averaged nearby futures price.

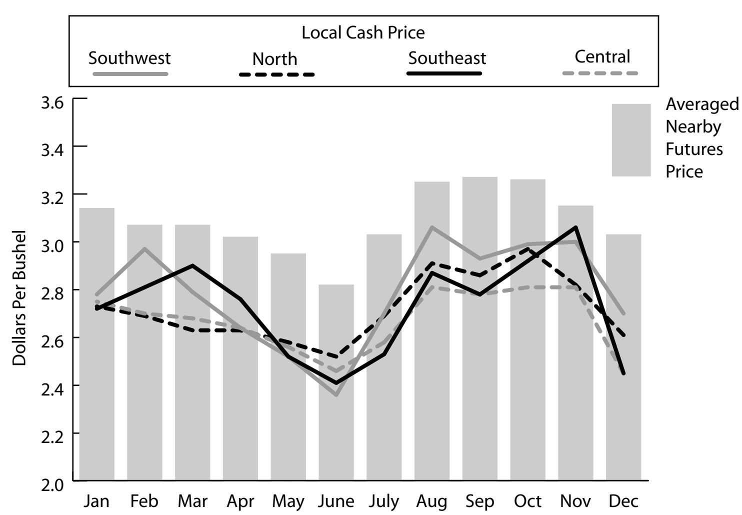


Figure 3-7. Adjusted seasonal local wheat cash prices in Georgia compared to averaged nearby futures price.

Evaluating Current Prices: Using Localized Historical Prices

We can use localized historical prices as a measuring stick to evaluate the current market offering. Knowing where prices have been at any point over the past few years can be helpful in evaluating current prices. It is often difficult to decide whether a current bid is relatively "attractive" without a benchmark for comparison.

We can use the information in Figures 3-5, 3-6, and 3-7 and "localize" it by using the historical basis for any given buying site. When we adjust the seasonal tendencies of the futures price by the local basis, we can derive a localized historical price. Consider Figure 3-8, which shows the localized historical price of soybeans in southeast Georgia during 1997 through 2002 and the localized price during the first six months of 2003. During June, prices have averaged about $5.00 per bushel over the past six years. In 2003, prices were near $6.00 per bushel—20 percent above what one might expect. That would indicate that a 2003 buyer's bid of $6.00 per bushel is relatively attractive and might be a good indication of a selling opportunity, compared to what was available over the past six years. The historical series also indicates that we might expect the current prices to decline in the months just ahead, if 2003 is a typical season.

Similarly, Figure 3-9 shows a comparison of historical and current wheat prices in Orangeburg, South Carolina. A historical downward trend in price occurs as the crop enters the harvest in May and June, with prices averaging less than $2.50 per bushel in June. In June of 2003, the localized cash price in Orangeburg was about $2.75 per bushel, indicating a relatively strong demand for wheat with a price nearly 10 percent more than the previous six-year average. In such a situation, the 2003 price would be interpreted as an attractive price, and growers should consider sales at harvest versus storage. The 2003 prices were near or below the historical average prices for the remainder of the months prior to harvest.

In Figure 3-10, we observe that the 2003 localized corn prices in western North Carolina

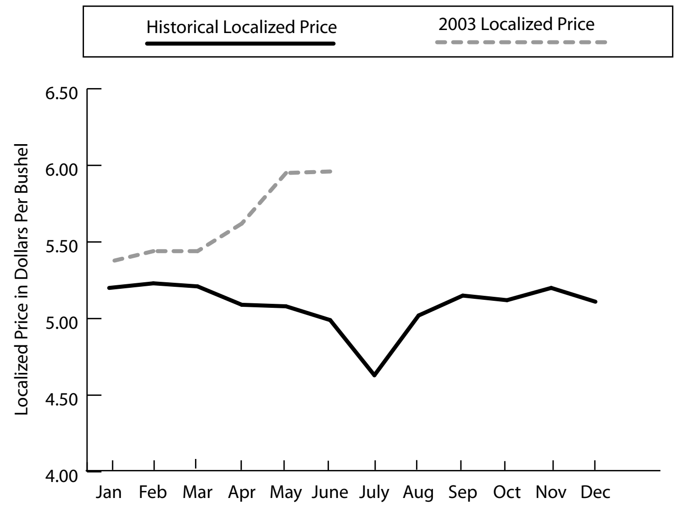


Figure 3-8. Southeast Georgia soybean prices, historical and 2003.

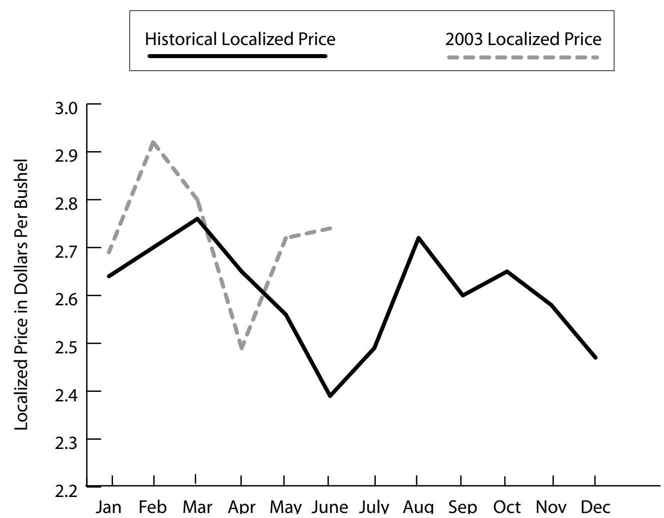


Figure 3-9. Orangeburg, S.C., wheat prices, historical and 2003.

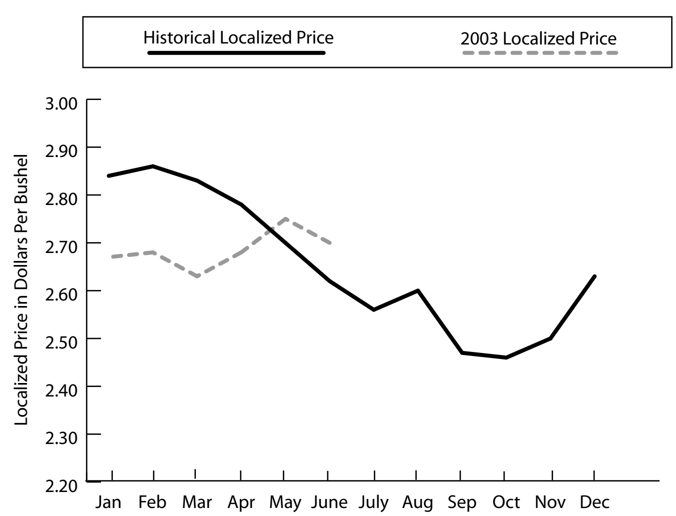


Figure 3-10. Western N.C. corn prices, historical and 2003.

were a good bit below the historical average until May. Local producers would not have seen any advantage from forward contracting the 2003 corn crop early in the year. In May, current prices were 5 cents more than the historical average, and, in June, the margin increased slightly to 8 cents more than the average. But the 2003 prices turned downward after the normal seasonal drop in prices during the growing season. Western North Carolina producers were confronted by a mild dilemma. While prices were above average in June, they were not above by much—only about 3 percent. It is not completely clear that the June price is strongly attractive. At the same time, it is not strongly unattractive either by historical standards.

LESSON

Historical localized prices can be used to decide whether it is beneficial to accept an offered price at any time. If the current bid is strong relative to history, then the bid is attractive and indicates a strong desire to buy by the purchaser and a good opportunity to sell for the seller. The converse is also true. By knowing what prices have been in the past, the seller can decide with greater confidence whether any given price offer is a strong one.

Summary

Basis data can be used in key ways to make more informed and effective risk-management decisions:

- Basis can be used to decide whether it is beneficial to accept a cash bid at any time. If the basis is strong relative to history, then the bid is attractive and indicates a strong desire to buy by the purchaser and a good opportunity to sell for the seller. The converse is also true. By knowing what the basis has been in the past, the seller can decide with greater confidence whether a price offer is reasonable.

- Basis can be used to evaluate forward contract offers. A stronger than expected basis, in conjunction with an acceptable price level, may signal an opportunity to eliminate price and basis risk by agreeing to a forward contract. This strategy is advantageous in that it provides protection from declines in price levels or weakening basis. The primary disadvantage is that it also precludes benefiting from price rallies or strengthening in basis once the contract is entered into. There is also production risk involved in delivering the specified contracted amount.

- Basis can be used to decide whether it is beneficial to hedge or use a forward contract. A weaker than expected basis, in conjunction with an acceptable price level, may signal an opportunity to eliminate price risk by hedging and retaining only basis risk. This strategy allows the producer to lock in the current price level, but not the basis, and the producer can benefit from any strengthening in basis. A stronger basis makes hedging less attractive (a weakening of basis is detrimental to a producer who is hedged) and may signal that a forward contract may be more appropriate.

- Basis can be used to determine the potential benefit of storage. Basis information, combined with carry and storage cost estimates, allows producers to make well-informed decisions about whether to defer the sale of their crops.

Chapter 4. Government Programs: How Do They Influence Price-Risk Management?

Chapter 3 provided an overview of the basic marketing strategies that producers can use to manage price risk. Government programs that provide an income safety net for agricultural producers interact with and affect those strategies in different ways, depending on price and production levels. In this closing chapter, we will focus on three income-support programs and their effects on the basic marketing strategies discussed in Chapter 3.

The latest Farm Bill, the Farm Security and Rural Investment Act of 2002, has a duration of six years and covers the 2002 through 2007 crop years. Our explanation of the income-support programs enacted by the bill draws on numerous sources, including the expansive information on the 2002 Farm Bill and its components, which can be found on the following Web sites:

USDA Main:
http://www.usda.gov/farmbill/

USDA-FSA Information:
http://www.fsa.usda.gov/pas/farmbill/

NC State University:
http://www.ag-econ.ncsu.edu/faculty/piggott/gmark.html

University of Georgia:
http://www.ces.uga.edu/Agriculture/agecon/agecon.html

Clemson University:
http://cherokee.agecon.clemson.edu/ag_policy.htm

This chapter will focus only on the Commodity Programs title of the bill, expressly the three income-support programs as they apply to the commodities discussed here: corn, wheat, and soybeans. The three programs are:

- Direct payments (also known as fixed payments)
- Target-price-based counter-cyclical payments
- Loan deficiency payments (a feature of marketing assistance loans)

First, we recognize the important contributions these government programs make to producer net income, particularly the income safety net they provide. There is not space here to discuss all the intricacies of these programs, and we recommend visiting the Web sites listed above for complete details. These income-support programs differ in the way payments are coupled to actual price movements and actual production:

- Direct payments are based on historic yields for each commodity. Direct-payment rates are set by law, and payments are completely decoupled from actual price and production in a given year.
- Counter-cyclical payments are coupled to the national average price for a commodity over the marketing year but decoupled from actual production.
- Marketing assistance loans and loan deficiency payments are coupled to USDA estimates of current local prices for commodities, as measured by the posted county prices, and actual production.

Direct Payments

Direct-payment (DP) rates are fixed through 2007. These payments are decoupled from actual price and actual production in any given year. In short, a producer will receive them regardless of what is produced and how much of it is produced. The rate for each commodity is fixed for the life of the program (2002 through 2007).

Table 4-1. 2002 Farm Bill Direct Payment Rates, 2002 – 2007

Commodity	Direct Payment Rate ($ per bushel)
Wheat	$0.52
Corn	$0.28
Soybeans	$0.44

The amount a producer would receive for each commodity is determined as follows:

(Base Acres x .85) X Payment Yield X DP Rate

LESSON

Direct payments are received regardless of actual plantings, production, or market price movements. Thus, they involve no price or production risk. Because producers receive direct payments regardless of what is actually produced, and because the payments are fixed by law, they are not a factor in marketing decisions. This income guarantee, however, can have an indirect impact on the economic factors that affect producers, such as cash flow, land rent, and land values.

Counter-Cyclical Payments

Counter-cyclical payments (CCPs) were introduced in the 2002 Farm Bill, but they are nearly identical to the deficiency payment system in farm programs that existed prior to 1996. These payments are decoupled from production, but not from the national season average price (NSAP) for a commodity. The USDA sets the CCP rate using the following formula:

CCP Rate = Target price – Effective price

The effective price used to compute the CCP rate for a commodity is the greater result of either of these two formulas:

National season average price + (DP rate)

or

(National loan rate) + (DP rate)

Thus, the maximum CCP occurs when the national season average price for a commodity is at or below the loan rate. Remember that both the loan rate and the DP rate are fixed. For example, the 2002 wheat effective price per bushel would be the higher of the following:

National season average price ($2.40) + DP rate ($0.52) = $2.92

or

Loan rate ($2.80) + DP rate ($0.52) = $3.32

In this example, the effective price would be $3.32, the result of the formula that yields the greater sum. Given the target price of $3.86, the CCP rate would be 54 cents per bushel ($3.86 minus $3.32). Table 4-2 displays the maximum CCP rates for each commodity.

Can CCP Payments Be Protected?

Since the introduction of CCP payments, producers have asked whether they can effectively hedge the CCP. Some brokers have encouraged producers to engage in strategies that attempt to lock in the CCP. This section discusses the merits of such a strategy.

Table 4-2. 2002 Farm Bill Maximum Counter-Cyclical Payments and Target Prices[1]

	Maximum CCP Rate [1] ($ per bushel)		Target Prices ($ per bushel)	
Commodity	2002 – 2003	2004 – 2007	2002 – 2003	2004 – 2007
Wheat	$0.54	$0.65	$3.86	$3.92
Corn	$0.34	$0.40	$2.60	$2.63
Soybeans	$0.36	$0.36	$5.00	$5.00

[1]National season average price (NSAP) at or below national loan rate plus direct payment rate.

The CCP program protects producers from decreases in national season average prices (NSAPs) as one facet of the safety net provided by income-support programs. The CCP is announced at the end of the marketing year for the crop. It has the characteristics of a European put option; that is, it can be thought of as a put option exercisable only on the last day of the marketing year. The premium is paid by the government (it is free to the producer), and the payoff function depends on how the NSAP compares with the loan rate (LR), the direct payment (DP) and the target price (TP). The payoff function for the CCP on the last day of the marketing year can be represented, in general terms, by this formula:

$$CCP = \max \{0, (TP - DP) - \max [LR, NSAP]\}$$

For example, consider the case of soybeans: The payoff function can be broken down and tabulated as follows:

Table 4-3. Counter-Cyclical Payment (CCP) Payoff Value for Soybeans at End of Marketing Season

Payoff Value ($ per bu)	Condition
0	NSAP > $5.36
$5.36 - NSAP	$5.00 < NSAP < $5.36
$0.36	$5.00 < NSAP

Note: TP=$5.80; DP=$0.44, and LR=$5.00

For soybeans, the CCP is capped at a maximum of 36 cents per bushel. The potential of receiving a CCP can be likened to this: The producer is being given an asset, a European put option, at the beginning of the marketing year that may or may not have intrinsic value on the last day of the marketing year. This asset's value, if any, will be determined by the projected national season average price at the end of the marketing year and how it compares with the loan rate, direct payment rate, and target price.

From a risk management perspective, this asset has two key characteristics that influence whether a producer can effectively hedge or protect its value:

- The payoff at maturity depends on the value of the NSAP, for which there is no futures market.
- The CCP is only exercisable at the end of the marketing year.

Because no futures market trades the NSAP, no underlying futures contract allows a producer, in effect, to offset the price risk associated with the NSAP. To offset price risk effectively, an underlying asset must exist that is traded on the futures market and that is strongly correlated with the asset one is trying to protect. The effectiveness of an offsetting strategy depends on the strength of this relationship: the stronger the relationship between the two assets, the more effective the strategy will be.

For example, one can hedge cash corn prices reasonably well with corn futures markets because cash prices and futures prices for the underlying asset (corn) are highly correlated. To hedge the CCP, producers ideally would have a futures contract for the NSAP. But such a contract does not exist. The futures contracts that trade on the Chicago Board of Trade (CBOT) represent the futures price of an underlying commodity on the contract expiration date, not the price averaged over the entire season. This distinction between the futures price on any day versus the season average is critical in assessing the effectiveness of using the underlying futures and options markets to hedge the CCP.

Because the CCP can be exercised only at the end of the marketing year, it resembles a European style put option, which can be exercised only on its maturity date. This raises the issue of cost effectiveness. Because a European option can be exercised only on its maturity date, we would expect a typical American put option to be more costly than the European. This difference in cost increases as the time between buying the option and maturity increases. The important thing to note is this: Strategies that attempt to hedge the CCP using American style options involve paying for the ability to exercise the option at any time. Therefore, these strategies suffer from not being highly correlated with the underlying asset (the NSAP). They also involve purchasing the ability to exercise the option throughout the marketing year, which is not necessary to protect an asset that pays off only at maturity.

LESSON

CCP payments are decoupled from production, and national season average price movements affect the level of final payment. Because each CCP rate is based on a national average season price over the marketing year, no effective means of hedging the CCP from shrinkage currently exists (no futures market trades the national season average price). Trying to hedge the CCP is likely to be ineffective. Moreover, it is likely to be cost-prohibitive, given the structure of this asset: its payoff is determined only at maturity (the end of the marketing year), and it cannot be exercised or captured throughout the marketing year.

Loan Programs and Loan Deficiency Payments

The underlying price support feature of the 2002 Farm Bill is the marketing loan program. Loan program benefits are coupled to local prices as determined by the USDA, and they are available on all actual production. As in the past, marketing loans themselves are nonrecourse loans. As such, the producer's obligation is limited to repayment at the lower of the posted county price (PCP) or the loan principal plus interest. Producers also retain the ability to simply forfeit the commodity in repayment of the loan.

Nonrecourse or "Regular" Loan Program

Producers can place an eligible commodity under the loan program immediately after harvest. Once a commodity is placed in the loan program, producers receive the loan rate on all bushels placed under loan. Loans are for a maximum of nine months. Forfeiture of the commodity is not considered a marketing loan gain for payment limitation purposes. This is important to remember if a producer is reaching the payment limit. There are three ways the loan can be subsequently satisfied:

- Repay the loan plus interest and storage.
- Repay and claim the loan gain.
- Forfeit the commodity.

If the PCP is below the local loan rate, crops may be redeemed and loans satisfied at the PCP. If the crop is redeemed at less than the loan rate, a loan gain results. For example, say the PCP in Iredell County, North Carolina, for corn is $2.00 per bushel and the local loan rate is $2.22 per bushel, then a producer could redeem corn from the loan and gain 22 cents per bushel.

If the PCP is above the local loan rate, crops may also be redeemed and loans satisfied prior to maturity. If a crop is redeemed when the PCP is above the loan rate and the loan is satisfied by paying loan principal plus interest, no loan gain results. For example, if the PCP in Iredell County, North Carolina, for corn is $2.32 and the local loan rate is $2.22, a producer could redeem corn from the loan program by repaying the $2.22 value borrowed plus interest.

The marketing loan program is available to producers at any market price. There is a $75,000 per producer limit on all marketing loan gains, and the "three-entity" rule continues to apply. In the regular loan program, a PCP can be locked in once for 60 days and the loan repaid anytime in the 60 days at that locked-in PCP. If not repaid in the 60 days, the locked-in PCP expires, and the loan can be repaid at that day's PCP.

Loan deficiency payments (LDPs) are available only when the PCP falls below the local loan rate. When an LDP is available, producers may choose to receive the equivalent of the loan gain in the form of a loan deficiency payment and subsequently hold or sell their crops in lieu of participating in the regular loan program. The loan program and LDPs are available until the final loan availability date for the covered commodity. These dates are when all outstanding loans must be satisfied and any available LDP claimed:

- Wheat – March 31 after harvest
- Corn and Soybeans – May 31 after harvest

LESSON

The loan program provides effective price support for actual production at the loan rate. It is essentially a "free" put option with the strike price at the loan rate. Any loan deficiency payments and marketing loan gains are coupled to local prices and actual production.

Loan Rates

Loan rates are set for 2002 through 2007 with a lower rate for wheat and corn after 2003 (Table 4-4). Loan rates are set for each appropriate county across the U.S. and may differ for adjacent counties. Table 4-5 illustrates selected county-level loan rates within the tri-state region.

Table 4-4. National Loan Rates, 2002 – 2007

Commodity	Loan Rate ($ per bu)	
	2002 – 2003	2004 – 2007
Wheat	$2.80	$2.75
Corn	$1.98	$1.95
Soybeans	$5.00	$5.00

Source: http://www.fsa.usda.gov/dafp/psd/

Beneficial Interest Issues

A producer must retain beneficial interest in the covered commodity to enter the crop in the loan program or be eligible to receive an LDP. Beneficial interest means the producer must retain:

- Control of the commodity
- Risk of loss
- Title to the commodity

Choice of marketing strategies and contracts can affect loan program access and receipt of LDPs (Table 4-6). Traditional strategies, such as delayed pricing (deliver and transfer title now and set price later), have declined in use because they result in the loss of beneficial interest to the producer.

LESSON

Producers must have beneficial interest in the covered commodity to enter the loan program and receive an LDP or loan gain. There is a $75,000 per producer limit on all marketing loan gains, and the three-entity rule continues to apply. Access to the LDP terminates on the final loan availability date.

Table 4-5. Selected County-Level Loan Rates in North Carolina, South Carolina, and Georgia

Commodity	National Loan Rate 2003	Iredell County N.C.	Kershaw County S.C.	Screven County Ga.
	$ per bushel			
Wheat	$2.80	$2.50	$2.50	$2.45
Corn	$1.98	$2.22	$2.19	$2.23
Soybeans	$5.00	$5.14	$5.04	$5.05

Source: http://www.fsa.usda.gov/dafp/psd/

Table 4-6. Cash Marketing Strategies and Contracts Can Affect Beneficial Interest

Contract/Strategy	Beneficial Interest Lost
Forward contract	At delivery
Basis contract	At delivery
Deferred pricing	At delivery
Futures hedging	At cash sale
Put option	At cash sale
On-farm storage	At cash sale
Commercial storage	At cash sale

Posted County Price Determination

The posted county price (PCP) for a commodity is calculated each weekday by USDA for all relevant counties in the United States. For corn, wheat, and soybeans, the PCP is calculated by taking the cash price in two terminal markets (often one is an export market) less an annual and daily (additional) adjustment as determined by the USDA. These two adjusted prices are compared every day (Monday through Friday), and the higher of the two becomes the PCP. When the local loan rate is less than the PCP, the difference becomes the LDP in effect the following day. PCPs and LDPs for any relevant U.S. county can be found at this USDA-FSA Web site:

http://www.fsa.usda.gov/dafp/psd/default.htm

The intent is for the PCP to reflect local market price conditions so that producers can receive a minimum net price that equals the loan rate. Although this is the objective, often the PCP is not equal to the local price and may be significantly different at times. If the PCP is below the cash price, it works to the producers' advantage: it allows them to capture a net price above the loan rate if they take an LDP payment on the same day as selling in cash market. The converse is also true: if the PCP is above the cash price, it works to the producer's disadvantage because it results in a net price that is below the LR.

With this knowledge, we can establish some useful relationships that help to explain these potential differences in PCP and cash prices. The PCP and the local cash price can be represented as follows:

PCP = Terminal Market Cash Price + Annual Adjustment + Daily Adjustment = (Nearby Futures Price + Terminal Market Basis) + Annual Adjustment + Daily Adjustment

Local Cash Price = Nearby Futures Price + Local Market Basis

As these formulas indicate, the futures price is factored into both the PCP and the cash price. Further, the futures price can be seen as the factor that affects the majority of day-to-day variations in both the PCP and the local cash price. If one looks at the difference between the PCP and the local cash price, we arrive at the following formula:

PCP – Local Cash Price = (Terminal Market Basis - Local Basis) + Daily Adj. + Annual Adj.

Because supply and demand conditions can vary between the terminal markets and the local market, we would expect to see some daily differences in the terminal basis and the local basis. The daily adjustment is an attempt to offset the difference. Furthermore, the annual adjustment may not completely capture the cost of transportation between the two markets on any given day. Therefore, the often-observed deviations in the PCP and the cash price can be attributed to significant differences in the terminal market basis and local market basis that are not offset by two annual and daily adjustments.

We can view differences between the local cash price and the PCP as short-term deviations that can be explained by unanticipated changes in demand and supply in the respective terminal and local markets. These changes were not fully offset by the adjustment mechanisms. In general, the PCP is meant to serve as a reasonable proxy for the local cash price in each county. As depicted in the formulas above, the local cash price can be thought of as the futures price plus local basis. And, as noted in Chapters 1 and 3, the greatest source of potential variation in the cash price stems from variation in the futures prices rather than the local basis.

Analyzing LDPs as a potential revenue source amounts to projecting PCP levels. By definition, an inverse relationship exists between the PCP and the LDP. As the PCP falls below the loan rate, the LDP increases. The converse is also true: As the PCP rises closer to the loan rate, the LDP decreases. Because the PCP is a proxy for cash prices, it follows that this same inverse relationship holds true for cash prices and the LDP. Likewise, because the greatest source of variation in cash prices can be attributed to changes in the futures prices, we can use seasonal variation in futures prices to explore when LDPs are likely to be highest. In simple terms, because of the relationships described above, lower futures prices lead to lower cash prices, which should also mean a lower PCP. And a lower PCP means a higher LDP. Stated more simply, lower futures prices mean a higher LDP.

In Chapter 3, indices of futures price levels were presented and discussed (Figures 3-1 through 3-3). Using these data, we can observe when futures prices tend to be lower during the marketing year. From this, we can tell when PCPs are likely be lowest and, thus, when LDPs are likely to be highest. By examining futures price data carefully, we can tell that low PCPs—and thus higher LDPs—tend to occur during harvest:

- Corn—September through November
- Wheat—May through July
- Soybeans—October through November

LESSON

The potential level of an LDP will be closely but inversely related to the historic seasonal trends in futures prices. The data collected over the past several years indicate that the PCP is typically weakest at, or just following, harvest for corn, wheat, and soybeans.

How Do Government Programs Affect Producer Marketing Strategies?

Producers face this challenge: to maximize profits when prices are uncertain, they must achieve the highest revenues available to them at the lowest possible cost. Revenues come from crop sales and government program payments. As indicated earlier, producers have no influence over the level of DPs or CCPs they receive. But they can decide when to collect the LDP if one is available. Therefore, to maximize profit, a producer must maximize crop revenue (by selling when futures prices are high and basis is strong) and maximize LDP income. This is a complex goal: futures and cash prices move in opposite directions from the LDP level. In other words, lower prices mean higher LDPs. How can we manage these two opposing forces?

One way to explore this is to look at the combined impact of market strategy performance when LDP levels are added. The objective is to sell when prices are high and claim the LDP when it is high. This often means separating the decisions into two points in time.

To see how the available market strategies interact with LDPs, consider a simple pre-harvest soybean pricing example. Four basic marketing strategies were discussed in Chapter 3:

- Cash sale at harvest
- Forward-contracting for harvest delivery (locking price and basis levels)
- Hedging with futures until harvest (locking in a price level with a futures contract)
- Hedging with put options until harvest (establishing a price floor in futures)

To see the effects of the various marketing strategies, assume that the following basic market conditions exist for soybeans (per bushel) at pre-harvest:

- Strategies are evaluated sometime before harvesting, either preplanting or during the growing season.
- November soybean futures (S-NOV) are \$6.00.
- The local loan rate (LR) is \$5.00.
- Local basis at harvest is assumed to be minus 25 cents, and it subsequently ends with an actual minus 25 cents.
- A November put option with a strike price of \$5.80 can be purchased for 30 cents (S=\$5.80, P=\$0.30).
- To keep things simpler, the PCP is assumed to do its job accurately and reflects the local price on a daily basis (in other words, the PCP = Local Market Price = Futures + Local Basis).

Marketing Strategy Performance Without LDPs

Figure 4-1 illustrates the net price a producer would expect to receive without LDPs across the basic marketing strategies at various futures price levels. The horizontal axis in the graph represents potential final futures prices, and the vertical axis represents the resulting net returns from the market. We can summarize our findings as follows:

- The **cash sale at harvest** results in lower returns as futures prices fall and higher returns as futures prices rise.
- The **forward contract** effectively locks in the price received regardless of final futures prices or basis. (Note that the forward contract and futures hedge yield the same result.)
- The **futures hedge** effectively locks in the price received regardless of final futures prices if the basis performs as expected.
- The **put option** provides a floor at lower futures prices while allowing for higher prices to be received as futures prices increase.

Preharvest Scenario
November Futures $6.00
Put Option (S = $5.80, P = $0.30)
Basis at Harvest - $0.25

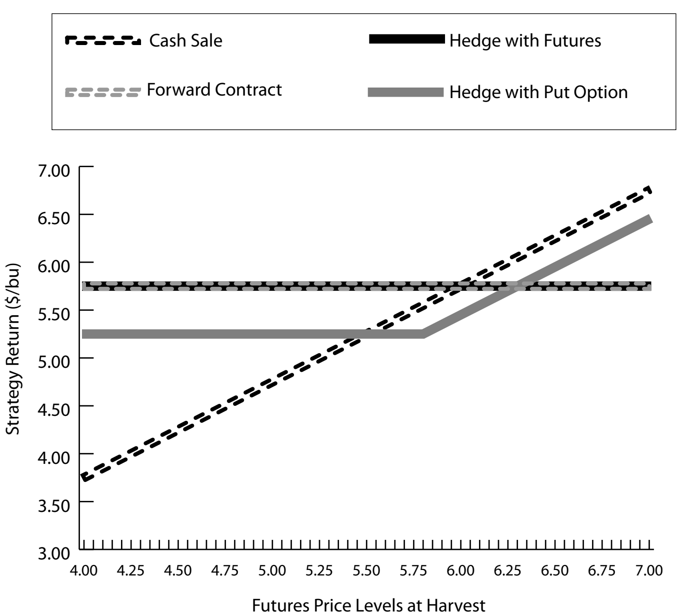


Figure 4-1. A comparison of returns from marketing strategies WITHOUT LDP receipts.

Because the expected basis of minus 25 cents actually occurred, the two fixed-price strategies (the forward contract and the futures hedge) yielded approximately the same result. (Futures commissions and other transaction costs would yield a slightly lower result for the hedge as compared to the cash forward contract.) This is not the case, however, if there is a change in expected basis. Any change in basis would affect the performance of the hedge because it is still subject to basis risk, whereas the forward contract is not (Figures 4-5 through 4-7).

The return realized by hedging using a put option is lower than the fixed-price strategies for futures price levels below $6.30. This reflects the 30-cent premium paid for the option. However, for futures price levels below $5.80 (the strike price for the put), hedging using the put option outperforms cash sale at harvest. As the realized futures price moves lower, the option strategy mimics the performance of the fixed price strategies. It becomes the second highest performing strategy (the forward contract and the futures hedge are equally better). It is second only by the amount of the option premium paid. Also, as realized futures continue to fall, the option delivers increasingly better results than the cash sale at harvest strategy.

As the realized futures price increases, the option mimics the performance of the cash sale at harvest strategy, coming in a close second again by the amount of the premium. As the realized futures price continues to increase, the option delivers increasingly better results than the fixed-price (futures hedge or cash contract) strategies. This is because the fixed-price strategies lock futures (or cash) price levels when the strategy is placed, whereas the option allows the producer to capture the higher prices if final futures are much higher.

What happens when the put-option strategy is repeated over several marketing years? A strategy that yields a consistent close second-place each time it is used will yield the best results from the standpoint of consistently effective price-risk management. A good analogy can be taken from sports. If a NASCAR driver never wins any race but always finishes a close second, he would likely be the season champion and the high-dollar winner for the season. Thus, the put option strategy is never the single best strategy for a marketing year, considering the spectrum of possible futures prices: If futures prices increase, a cash sale at harvest is best. But if futures prices decline later, fixing the price now is the best. But when repeated over several years, the put-option strategy is extremely effective because it consistently performs well.

LESSON

Put options are powerful tools for price risk management. They imitate the risk protection properties of fixing the price in a declining market while allowing for gain in an increasing market. Regardless of price direction, options will result in a second-place finish to the ultimate "best" strategy. It follows that, in the longer term, option purchases would, over time, through repeated implementation, yield good results from a risk management standpoint.

Adding the LDP to the Mix

When LDPs are present, the crop revenue will be the combination of the LDP receipts plus the returns obtained through the marketing strategies employed. Consider the example of marketing soybeans again. We will explore the combined impact of LDPs and market strategy returns over a range of potential price outcomes under three scenarios:

- **Scenario 1.** When the harvest futures (S-NOV) are *near* the loan rate at preharvest when strategies are being planned (for example, soybean futures are at $5.00 per bushel).
- **Scenario 2.** When harvest futures (S-NOV) are well *below* the loan rate at preharvest when strategies are being planned (for example, soybean futures are at $4.20 per bushel).
- **Scenario 3.** When harvest futures (S-NOV) are well *above* the loan rate when the strategies are being planned (for example, soybean futures are at $6.50 per bushel).

Scenario 1: When Harvest Futures Are Near the Loan Rate

When initial futures prices are near the loan rate of $5.00 and LDP receipts are added to determine the total revenue of market returns and government payments, the performance of the four basic strategies can change dramatically (Figure 4-2). When realized returns proceed to levels above the loan rate ($5.00), the LDP disappears and the results of marketing strategies simply revert to those shown in Figure 4-1.

If futures prices subsequently fall to lower levels, a cash sale at harvest provides an outcome similar to the put option illustrated in Figure 4-1. As a result, the loan program is often referred to as a "free" put option. It provides a floor at the loan rate and allows for realizing higher prices if they occur.

LDPs are added to the futures contract hedge and forward contract strategies as prices fall. In effect, at lower prices, these strategies are retaining the fixed price that was locked in with either a forward contract or the futures hedge ($4.75), and the LDP is adding to the total revenue. The

Preharvest Scenario 1
November Futures $5.00
Put Option (S = $4.80, P = $0.30)
Basis at Harvest - $0.25

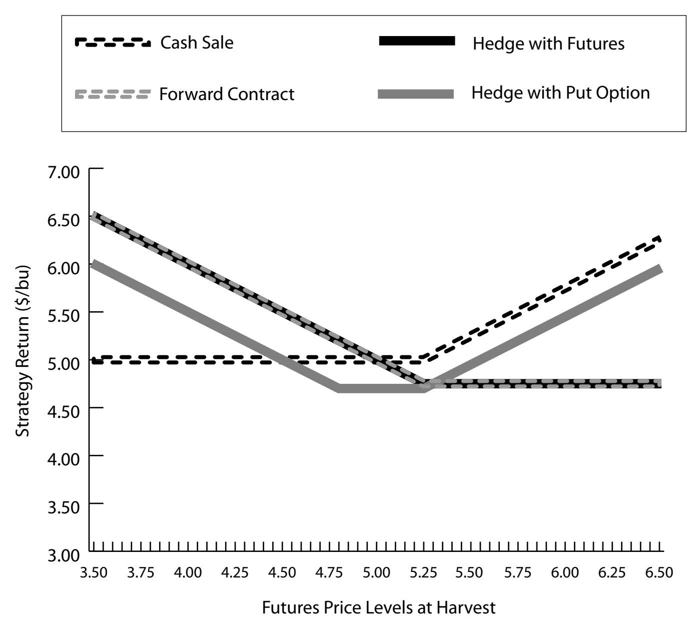


Figure 4-2. A comparison of returns from marketing strategies WITH LDP receipts.

combination of a fixed-price strategy and the LDP available at low prices creates a "2-for-1" situation. That is, when the market falls below the fixed price, the forward contract or futures hedge provides "1-to-1" protection. Furthermore, the LDP also provides "1-to-1" protection when it becomes available. Thus, any price decline below the loan rate creates a 2-for-1 return. For each 1-cent downward movement of the realized futures price, the net price received increases by 2 cents. Results at low futures prices yield an environment where the return is well above the prevailing price. However, at higher prices, the locked-in $4.75 prevails, and the LDP goes away. The two fixed-price strategies are capped for realized returns at higher levels.

The most interesting strategy is, perhaps, the put option. As prices fall, the LDP adds to the floor set by the option, much as it does with the futures contract hedge or cash forward contract. This is, again, effectively capturing a "2-for-1" return. Note, however, that when the realized futures prices are low, the option return falls slightly below that of the fixed-price strategies by the amount of option premium paid. At higher realized futures prices, the option allows a producer to capture the higher market prices that occur. In the upper price ranges, the option performs much like the cash-sale-at-harvest strategy. Again, it yields less than the cash-sale strategy by the amount of the option premium paid and substantially better than the fixed-price strategies.

Over the entire range of futures prices examined, the put option yields a bowl- or U-shaped result. We can interpret this as follows: We know at strategy inception (preharvest) that the worst return a producer would achieve is to receive the minimum set by the bowl bottom ($4.70 per bushel, in this example). At any other futures price, higher or lower, the put option yields better results. Clearly, this is a powerful potential strategy for reducing price risk.

Note this final point about the basic alternative strategies, the LDP, and price risk. From a revenue standpoint, producers are essentially in an odd situation after either forward-contracting or hedging with futures or options. In a sense, they are wishing for realized futures prices that fall below the loan rate, thereby allowing them to receive the "2-for-1" deal. This is an obscure and unintended phenomenon that comes about as a result of the current Farm Bill and previous ones.

Scenario 2: When Harvest Futures Are Below the Loan Rate

Figure 4-3 illustrates the performance of the four basic marketing strategies when the pre-harvest futures price levels are well below the loan rate, which in this example is $4.20. If prices subsequently fall, the cash-sale-at-harvest strategy holds a steady result because the LDP increases to offset the lost market revenues. Furthermore, when realized prices fall below the $4.20 level, forward-contracting, hedging with futures, or hedging with a put option all capture the "2 for 1." If prices rise subsequently, the put-option and cash-sale-at-harvest strategies perform similarly to one another, but the results are separated by the amount of option premium paid. Hedging using futures prices and forward-contracting, however, takes a significant turn for the worse if futures prices move higher coming into harvest: the LDP is lost, and the sale price is fixed at the lower level. At these lower price levels and with a stronger likelihood of prices increasing, the cash sale at harvest or hedging with a put option should prevail as the preferred strategy.

Scenario 3. When Harvest Futures Are Above the Loan Rate

Figure 4-4 illustrates the performance of marketing strategies when the preharvest futures price levels are well above the loan rate, in this example $6.50. The four basic marketing strategies perform as illustrated in Figure 4-1 because, at higher price levels, there is no LDP in effect. The bowl-shaped pattern is only apparent at local price levels near the loan rate. In this example, with an assumed basis of minus 25 cents per bushel, futures prices falling below $5.25 will trigger an LDP. The bottom of the bowl will be longer (or flatter for a greater range of futures prices) as preharvest futures rise higher than the loan rate. At these higher price levels and with a stronger likelihood of prices declining, a forward

Preharvest Scenario 2
November Futures $4.20
Put Option (S = $4.00, P = $0.30)
Basis at Harvest - $0.25

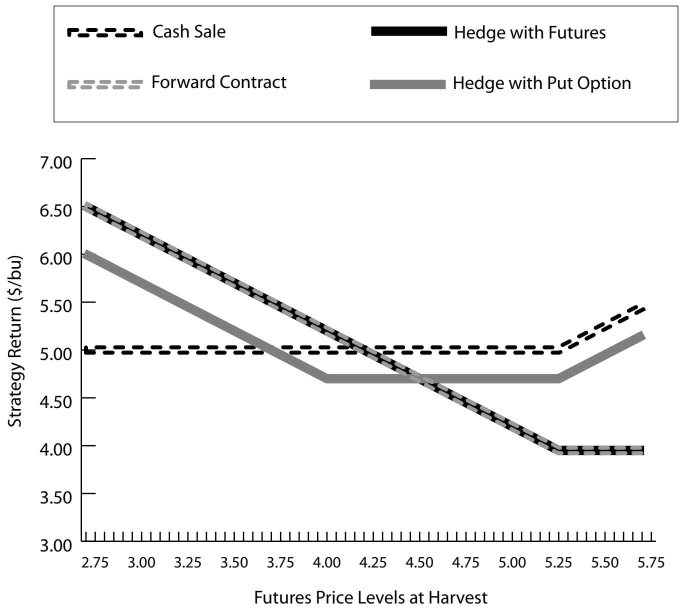


Figure 4-3. A comparison of returns from marketing strategies WITH LDP receipts.

Preharvest Scenario 3
November Futures $6.50
Put Option (S = $6.30, P = $0.30)
Basis at Harvest - $0.25

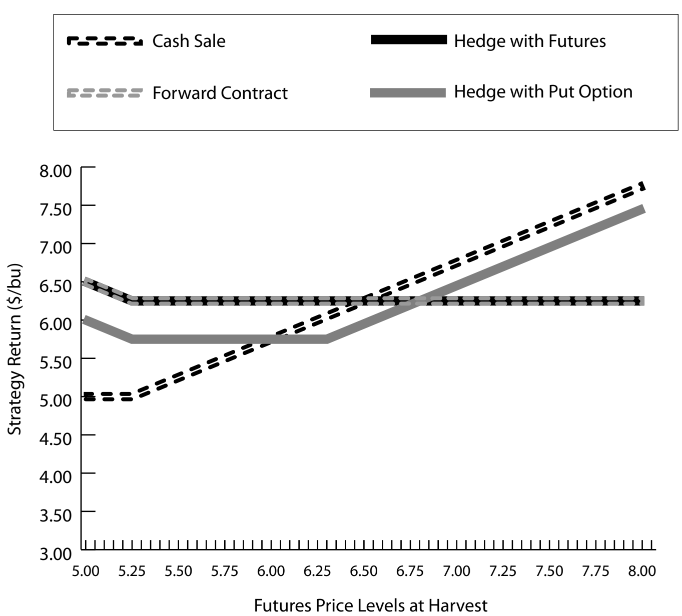


Figure 4-4. A comparison of returns from marketing strategies WITH LDP receipts.

contract or hedging with futures or a put option should prevail as the preferred strategy.

LESSON

When a wide range of potential futures prices and LDPs are considered, the put-option strategy yields a "U-shaped" result when realized local prices are close to the loan rate. By using this strategy, a producer knows at preharvest what his or her lowest net price might be. That is, the producer will receive the minimum set by the bowl bottom. At any other price, higher or lower, the put option yields better results. From an income perspective, this strategy comes in a consistent second at either end of the futures spectrum (high or low). Not being best at either extreme is the price one pays for being more consistent regardless of price outcome. After comparing the four basic strategies and considering market conditions and LDPs, we can see that buying a put option becomes the most powerful strategy for meeting risk management and revenue objectives. This occurs at price levels at or below the loan rate because the 2-for-1 gain takes effect.

What Happens When Basis Changes?

Changes in basis affect the four basic marketing strategies differently. Forward contracts lock in the local price (the product of futures price and local market basis), so a change in basis will not affect this strategy. But hedging with a futures contract or put option locks in only the futures price while leaving a producer open to basis risk. A cash sale at harvest is also subject to basis risk. The LDP reflects distant cash market prices plus adjustments. Therefore, we can assume that local basis conditions will not affect the LDP, but basis in the distant cash market will affect the LDP.

When Basis Strengthens

If the local basis strengthens, we would expect strategies that did not lock in the basis to benefit. Return to our example of soybean pricing in Figure 4-1 where the preharvest futures price is $6.00 per bushel. Consider one fundamental change: a strengthening in basis. We expect harvest basis to equal the historical harvest basis of minus 25 cents. But what if the actual basis turns out to be stronger? What if basis is minus 5 cents (a strengthening of 20 cents)?

Figure 4-5 shows the results of the stronger basis. The strategies that did not lock in local basis benefit from the strengthening of 20 cents. The cash sale at harvest, the futures hedge, and the put option results all shift upward, reflecting the improved basis.

To clarify this, Figure 4-6 shows the impact of this strengthening in basis for three strategies—the hedge with a futures contract, the hedge with a put option, and the cash sale at harvest—without considering the LDP receipts. Compare Figure 4-6 with Figure 4-1 (the strategies represented by the dotted lines in Figure 4-6 are the same as those represented in Figure 4-1, so the contrast is clear). Note that the forward contract is not shown in Figure 4-6 because it is not affected by the change in basis.

Now return to Figure 4-5. The results of the forward contract are lower than those from the futures hedge because the forward contract locked in the basis at the historical expectation of minus 25 cents. Finally, note that a strengthening in basis is beneficial only to the other three strategies when realized futures price levels rise above an amount equal to the loan rate less the basis. A strengthening in basis at price levels below the loan rate is fully offset by an equal reduction in the size of LDP. Therefore, when preharvest price levels are below the loan rate, the best strategy is to hedge using futures rather than to forward-contract because no apparent basis risk exists as long as the realized price remains below the loan rate.

Preharvest Scenario
November Futures $6.00
Put Option (S = $5.80, P = $0.30)
Expected Basis at Harvest -$0.25
Stronger Basis at Harvest -$0.05

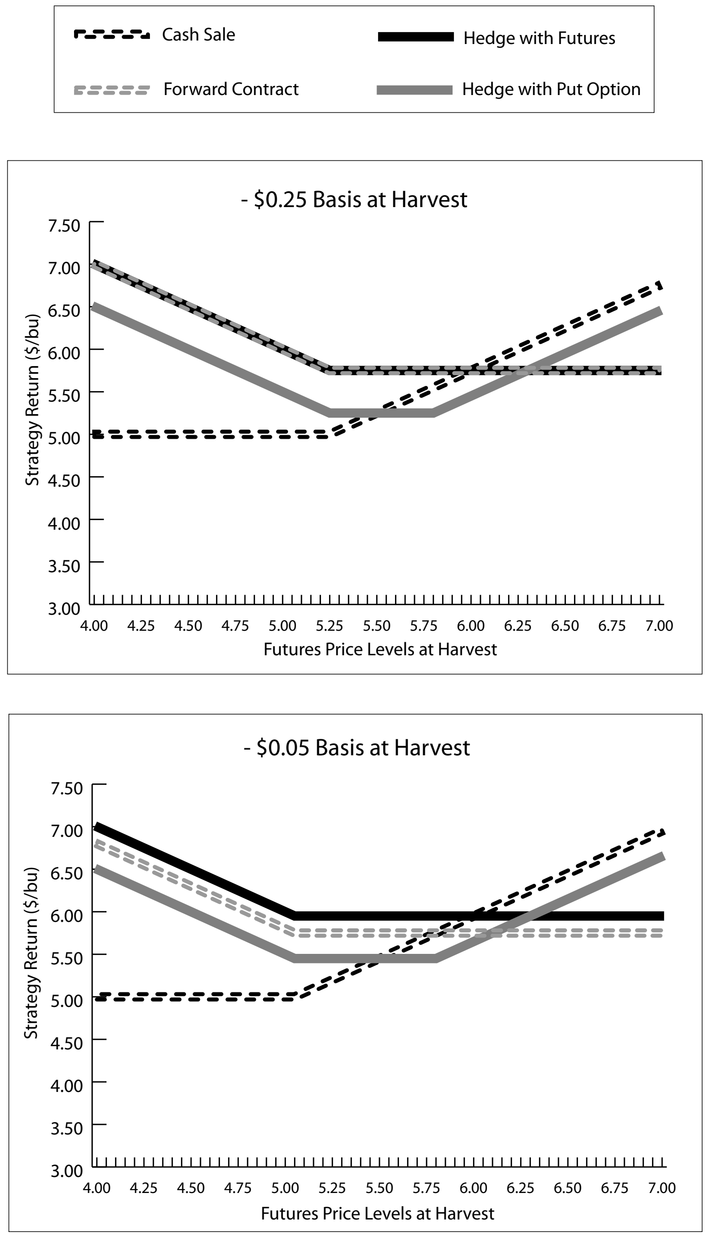


Figure 4-5. A comparison of returns from marketing strategies WITH LDP receipts when basis strengthens.

Preharvest Scenario
November Futures $6.00
Put Option (S = $5.80, P = $0.30)
Expected Basis at Harvest -$0.25
Stronger Basis at Harvest -$0.05

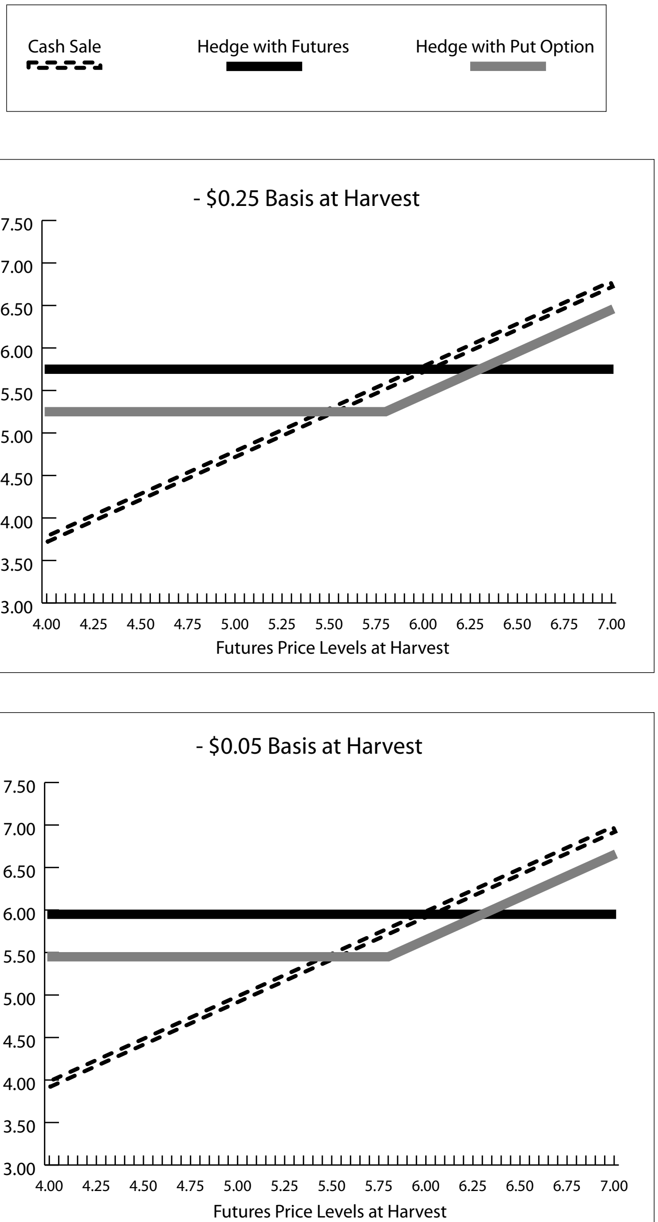


Figure 4-6. A comparison of returns from marketing strategies WITHOUT LDP receipts when basis strengthens.

When Basis Weakens

When the basis weakens, strategies that do not lock in the basis perform worse than expected. Return to our example of soybean pricing in Figure 4-1 where the preharvest futures price is $6.00 per bushel. Now consider this fundamental change: a weakening in basis. Again we expect harvest basis to equal the historic harvest basis of minus 25 cents. But what if the actual basis turns out to be weaker? What if basis turns out to be minus 40 cents (a weakening of 15 cents)?

Figure 4-7 shows the results of the weaker basis. The return from the strategy that locked in the local basis—the forward contract— improves when the basis weakens. The return from any of the other three strategies—cash sale at harvest, a futures hedge, and a put option—shifts downward, reflecting the cash price that is 15 cents less than expected. In this case, the return from the forward contract is greater than that from the futures hedge because the forward contract locked in the basis at the historical expectation of minus 25 cents.

Note one final point: a weakening in basis has an adverse impact on the other strategies when realized futures price levels rise above an amount equal to the loan rate less the basis. Remember, a weakening in basis at price levels below the loan rate is fully offset by an equal increase in the LDP. This means that when preharvest prices are below the loan rate, a producer should hedge using futures rather than forward-contract because there is no apparent basis risk as long as the realized prices remain below the loan rate.

Preharvest Scenario
November Futures $6.00
Put Option (S = $5.80, P = $0.30)
Expected Basis at Harvest -$0.25
Weaker Basis at Harvest -$0.40

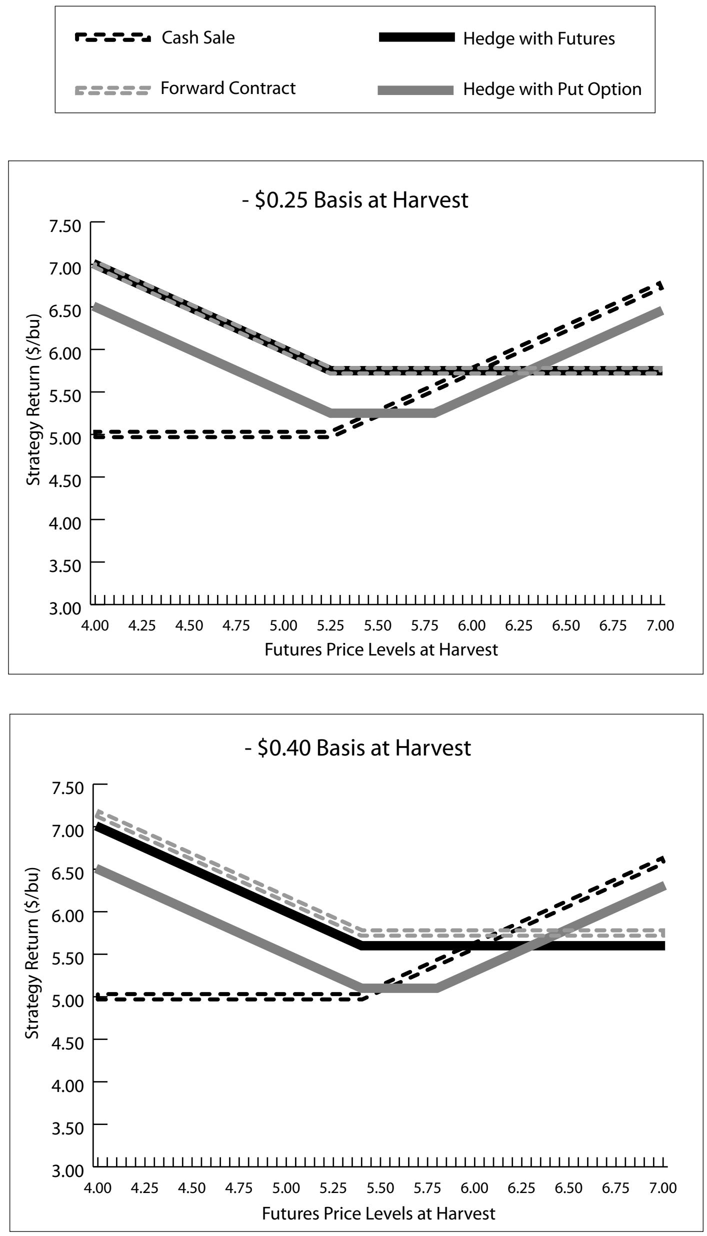


Figure 4-7. A comparison of returns from marketing strategies WITH LDP receipts when basis weakens.

LESSON

When actual basis differs from historic local basis, the results of a marketing strategy that does not lock in the basis will be less or more than expected. A strategy will yield different results depending on its exposure to basis risk. Any differences, however, will be apparent only if realized futures price levels rise above an amount equal to the loan rate less basis. Remember, a weakening in basis at price levels below the loan rate is fully offset by an equal increase in the size of the LDP. And a strengthening in basis at price levels below the loan rate is fully offset by an equal decrease in the LDP.

Summary

Our comparison of the four basic marketing strategies in relationship to three income-support programs provided by the 2002 Farm Bill indicates the following:

- Of the three basic forms of income-support programs included in the 2002 Farm Bill—direct payments, counter-cyclical payments, and loan deficiency payments—only one, the loan program or loan deficiency payment, makes a significant impact on marketing decisions. A producer will accrue direct payments and counter-cyclical payments regardless of the marketing strategy used, and attempts to protect (or hedge) the received levels are unnecessary and may be cost-prohibitive.

- Loss of beneficial interest occurs at different times for various marketing strategies. It is essential that producers preserve beneficial interest in their commodities prior to capturing the loan deficiency payment. Producers need to understand clearly the nature of the pricing strategies they are using to retain their ability to acquire a loan deficiency payment.

- The potential level of a loan deficiency payment will be closely, but inversely, related to the historic seasonal trends in futures prices. The data accumulated for the past several years indicate that the posted county price is typically weakest at or just following harvest for corn, wheat, and soybeans.

- When a wide range of potential futures prices and loan deficiency payments are considered, the put-option strategy yields a "bowl-shaped" result as realized futures prices reach the loan rate. Producers would receive, at worst, the minimum price set by the bowl bottom. At any other futures price, higher or lower than the loan rate, the put-option strategy yields better results.

- After comparing the four basic strategies and considering market conditions and loan deficiency payments, purchasing a put option emerges as the most powerful strategy for risk management and income objectives. This occurs at price levels at or below the loan rate because a 2-for-1 gain takes effect below the loan rate.

- Considering loan deficiency payments, strategies that do not lock in a basis amount will yield different results depending on how basis performs. These differences will be apparent only when realized futures prices rise above an amount equal to the loan rate minus basis. As basis weakens at price levels below the loan rate, the loan deficiency payment increases by a like amount. As basis strengthens at price levels below the loan rate, the loan deficiency payment decreases by an equal amount.

Conclusion

As we noted in the introduction to this book, agricultural producers face many risks, including the price risks that are inherent in a changing marketplace. Ultimately, managing those risks depends on knowledge about price structures, knowledge about historical price trends, and knowledge about the strategies available and how they relate to current government programs. We developed this book for a specific purpose: to give wheat, corn, and soybean producers the knowledge they need to develop effective price-risk management strategies.

In Chapter 1, we presented the basic concepts that underlie local cash prices, forward contracts, and futures contracts. Chapter 2 provided an overview of how prices and basis have behaved historically for each commodity in each market area of three states. In Chapter 3, we explored the basic marketing strategies that a producer can use to manage volatile prices. Finally, in Chapter 4, we investigated the effects of three 2002 Farm Bill income-support provisions on each of these marketing strategies.

By intention, we have focused on three states: North Carolina, South Carolina, and Georgia. Wheat, corn, and soybean producers in this tri-state region confront similar conditions as growers devote more acreage to cotton, as more grain is railed in from other regions, and as processors change or close locations. Yet local conditions vary throughout each state based on market conditions, transportation, and processing in each marketing area. Therefore, we have developed historical basis data for selected locations in the three states for a five-year period, from 1997 through 2002. That information is available on the Web site noted in the Appendix. We hope that the information provided here will assist growers in the tri-state region as they develop strategies to manage price risk and prevent revenue losses.

Appendix

Supplemental tables documenting the historical price basis for North Carolina, South Carolina, and Georgia, for corn, wheat, and soybeans (for 1997 through 2002), complement this publication. These tables are available electronically (in Excel spreadsheet format) for 47 soybean locations, 54 corn locations, and 33 wheat locations within the tri-state region. This information can be can be found at the following Web site:

http://www.ag-econ.ncsu.edu/faculty/piggott/handbook.htm.

The following locations by state and commodity can be downloaded.

NORTH CAROLINA		SOUTH CAROLINA			GEORGIA		
Soybeans	**Corn**	**Soybeans**	**Corn**	**Wheat**	**Soybeans**	**Corn**	**Wheat**
Barber	Barber	Anderson	Johnston	Anderson	Decatur	Decatur	Decatur
Rosehill1	Candor	Johnston	Florence	Johnston	Sumter	Sumter	Sumter
Rosehill2	Cofield	Florence	Hamer	Florence	Mitchell	Mitchell	Mitchell
Creswell	Laurinburg	Hamer	Lynchburg	Hamer	Bulloch	Bulloch	Bulloch
Dunn	Rosehill1	Lynchburg	Bennettsville		Burke	Burke	Burke
Elizabeth	Rosehill2	Bennettsville	Lake City		Laurens	Laurens	Laurens
City	Monroe1	Lake City	Latta		Washton	Washton	Washton
Greenville1	Monroe2	Latta	Little Rock		Calhoun	Chatuga	Chatuga
Greenville2	Nashville	Little Rock	Vance		Southwest	Scoular	Mobile
Kinston	Roaring River	Vance	Allendale		Southeast	Southwest	Scoular
Lumberton	Statesville	Allendale	Manning		Central	Southeast	Southwest
Mount Ulla	Chadbourn	Manning	Alcolu		North	Central	Southeast
Norwood	Creswell	Alcolu	Orangeburg			North	Central
Pantego	Dunn	Orangeburg	Orangeburg2				North
Williamston	Greenville1	Orangeburg2	Monetta				
Cofield	Greenville2	Estill	Sumter				
Fayetteville	Kinston	Kershaw	Estill				
	Lumberton	Charleston	Cassatt				
	Norwood		Charleston				
	Pantego		Kingstree				
	Williamston						

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