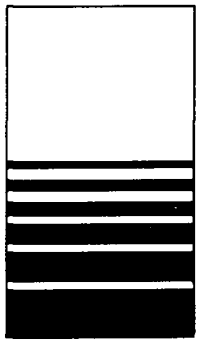
$3.25



BUSINESS MANAGEMENT IN AGRICULTURE

A joint project of the Cooperative Extension Service, Farm Credit and Chicago Mercantile Exchange

Understanding basis

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Understanding basis

Carl O'Connor

Kim Anderson

This is one module of the *Business Management in Agriculture* series and is intended to be used with its corresponding videotape. The script may vary from the actual videotape text.

Carl O'Connor is a professor of agricultural and resource economics and Extension marketing specialist at Oregon State University. He is a consultant of educational programs to the Chicago Board of Trade, the Chicago Mercantile Exchange, and Farm Credit Services, St. Paul, Minn.

O'Connor has authored more than 200 articles published in the popular press dealing with livestock marketing, including hedging and the use of options, and appears regularly on radio and television. He is a former assistant professor at Iowa State University, and holds a Ph.D. in agricultural economics from Oregon State University.

Kim B. Anderson is an associate professor and Extension grain marketing specialist at Oklahoma State University. He writes a biweekly column on grain marketing for the *Southwest Farm Press*, has a weekly radio program broadcast over 48 stations, and appears on televised agricultural programs several times a year to share his expertise in grain and livestock marketing.

Anderson has written more than 200 articles for the popular press, academic journals, and Extension publications on grain and livestock marketing and risk management. He is a former assistant professor at the University of Kentucky. Anderson holds a Ph.D. in agricultural economics from Oklahoma State University.

Purpose

The purpose of this module is to help you:

1. appreciate why an understanding of basis and basis patterns are an essential key to making sound marketing decisions;
2. learn how to select a basis along with the appropriate futures contract to:
   a. make cash price projections for commodities,
   b. calculate expected hedge prices,
   c. estimate minimum and maximum prices for your marketable commodities, and
   d. compare the merits of one or more forward cash contracts being offered in the marketplace;

3. interpret basis signals and evaluate appropriate marketing alternatives in order to time sales of commodities for maximum profits; and
4. understand basis risk as an alternative to price risk.

Videotape script

By Carl O'Connor and Kim Anderson

Fred— Today we are going to explore in detail a very important agricultural marketing concept—*basis*. You may not be familiar with the term basis; however, as a lender, I'm concerned that farm managers learn and thoroughly understand basis and basis patterns. Why? Because understanding basis is absolutely essential in using commodity futures or options to hedge or forward price commodities. Basis is also helpful to the farm manager in making price projections or in comparing alternative prices that may be offered in the marketplace. Another use of basis is to assist in determining when to market grain. You'll discover in this module that basis is an essential key to good marketing.

The purposes of this module are to help define basis, to introduce the various uses of basis in making farm management decisions, and to discuss basis risk. To begin with a definition of basis, we're pleased to have with us Dr. Carl O'Connor, professor of agricultural economics at Oregon State University. Welcome Carl.

Carl— It's good to be here, Fred.

Fred— Carl, what is basis?

Defining basis

Carl— The term *basis* refers to the difference between any two prices. When discussing agricultural commodity markets, basis refers to the difference between a specific cash market price and a specific commodity futures contract price.

Fred— Does this mean there is only one basis?

Carl— No. Since there are many cash commodities, many cash markets for each commodity, and from five to eight commodity futures contracts for each commodity, there is nearly an infinite number of basis.

Fred— It sounds like basis could quickly become very confusing.

Carl— Not really, Fred, because for any given marketing decision, there typically will be only one set of cash and

BASIS

A cash price minus a commodity futures contract price.

futures prices. Thus, there is only one basis relevant to that particular decision. I like to use the formula *basis = cash price – the futures contract price* to represent the difference between cash and futures price. For example, if the local cash price for 600- to 700-pound feeder steers is $76 per hundredweight (cwt.) and the Chicago Mercantile Exchange May feeder cattle contract price is $77.50, then the local feeder cattle May basis is a negative $1.50 (–$1.50) per cwt. Another way we often see this reported is to say that the basis is $1.50 under the May contract.

Fred— That simplifies basis a lot.

The right cash and futures price

Carl— It is simple, yet basis is also complex. To use the formula *basis = cash price – the futures contract price* requires the use of the *right* cash price and the *right* futures contract price.

Fred— Carl, earlier you said that there are five to eight future contracts for each commodity.

Carl— Yes. Each contract represents a specific month in which the contract expires. A basis calculated by using the July wheat contract price is not the same as a basis calculated by using a December wheat contract price because of the different expiration dates.

Likewise, the basis calculated using the Kansas City Board of Trade July wheat contract price is not the same as the basis calculated using the Chicago Board of Trade July wheat contract price. The Kansas City Board of Trade wheat contract represents a hard red winter wheat basis, while the Chicago Board of Trade wheat contract represents soft red winter wheat.

Fred— Are there any other specifics we should be aware of regarding basis?

Commodity and location specific

Carl— Basis is also commodity and location specific. For example, if you produce 500- to 600-pound heifers and use 500- to 600-pound-steer prices to calculate your basis it will bias your results. Or, if your 600- to 700-pound steers are an exotic breed, your basis will be different than for another person selling black baldies, Hereford, or Angus cattle.

Fred— So, by definition, basis adjusts price for variation in quality, quantity, and location.

Carl— Exactly. An example would be the Chicago Mercantile Exchange July live hog contract representing 210- to 240-pound hogs that will be delivered to Peoria in July. If you are selling hogs at another location of a different weight or at a different time, your basis will vary from the July basis calculated at Peoria.

Fred— Let's see if I understand what you have told us. To be effective, the basis you use must reflect the cash price for what you produce and a futures contract which logically relates to your marketing decision. The basis must be for the right commodity, at the right cash location, at the right commodity exchange, and for the right delivery month. Is that right?

Carl— That's correct, Fred.

Fred— In summary, Dr. O'Connor has explained basis as the difference between two prices. Normally the two prices are a specific cash price and a specific futures contract price. A meaningful and useful basis reflects the relativity of a cash price for your commodity with respect to a specific location, quality, time of sale, and a specific futures contract.

Let's stop the videotape and join your facilitator in discussing basis and working through some exercises which review specific futures contracts and basis calculations.

STOP 1

(pause)

CME HOG CONTRACT

1. July
2. Live hogs
3. 210-240 pounds
4. Peoria

Using the basis

Fred— The next part of this tape consists of several short segments under the general title "Using the basis." Now that we have defined basis, we want to explore how you may use basis in your farm management decisions. There are several uses of basis including estimating an expected cash price, estimating an expected hedge price, estimating expected minimum or maximum prices, determining if a forward contract offer is a "good offer," and determining when to market a stored commodity. Let's get started on the first of those topics.

We've asked Dr. Kim Anderson, professor of agricultural economics at Oklahoma State University, to explain how to use basis to make cash price projections. Welcome, Kim.

USES OF BASIS

- Estimating:
  - Cash price
  - Hedge price
  - Minimum or maximum price
- Determining:
  - Good offer
  - When to market

APRIL PRICE OUTLOOK	
April feeder contract	$78.50
Expected basis	+ 3.00
Expected cash price	$81.50
Price objective	$80.00

Using basis for price projections

Kim— Thank you, Fred. The commodity futures market is a good predictor of agricultural commodity prices. In fact, there appears to be no significant difference between most systems that are commonly used to forecast agricultural prices. However, in order to use commodity futures contract prices to forecast cash prices, the contract price must be adjusted for the appropriate time period, market location, and class of commodity. The local basis is used to make these adjustments.

Fred— Can we try an example, Kim?

Kim— Let's say, for example, you are evaluating buying 425-pound steers to graze wheat pasture. The steers are medium frame and the weight range is between 400 and 450 pounds. You expect the steers to weigh 675 pounds next April. The break-even price plus $4.50/cwt. return is $80. Now the question is, What is the expected price of 675-pound steers next April?

One price forecast can be obtained by adjusting the Chicago Mercantile Exchange April feeder cattle contract price by the expected local basis. Remember, we have defined basis as the local cash price minus the futures contract price. For example, if the April feeder contract price is $78.50 and the expected April basis for 675-pound steers at your local market is $3, then the expected April cash price is $81.50 ($78.50 + $3).

You can then compare the expected April cash price, $81.50, with the price objective of $80. This comparison shows an expected $1.50 return over our objective.

Fred— It seems what you are telling us is that the futures market should be used to forecast prices only when it has been adjusted by the local basis.

Kim— That's the important point.

Calculating a hedge price

Fred— The most frequent use of a futures market contract is to establish a hedged position. Carl, would you explain how to use the basis to estimate the expected hedge price?

Carl— An expected hedge price may be calculated the same way as the expected cash price. The only difference is that the hedge price should include adjustments for brokerage fees and interest charges.

Let's go back to the 675-pound steers Kim just described. The Chicago Mercantile Exchange April feeder cattle contract price was $78.50 and the expected basis was $3. Now assume that brokerage fees and interest are $0.40

/cwt. The expected hedge price would be $81.10 ($78.50 + $3 – $0.40). This is $1.10 above the price objective of $80.

Fred— How do you calculate brokerage fees?

Carl— The brokerage fee is simply your negotiated fee with your broker converted to a hundredweight price. Let's say it costs you $75 per contract for brokerage commissions. A Chicago Mercantile Exchange (CME) feeder cattle contract is for 440 hundredweight. The fee on a hundredweight basis for feeder cattle is $75 divided by 440 cwt., which equals $0.17/cwt. or less than $0.002/lb.

Financing your hedge

Carl— I highly recommend you finance your hedge with an operating loan specifically designed for financing a hedge. The details of this loan should be spelled out in a three-party agreement between you, your lender, and your broker.

Fred— How much money will I need to borrow, and should this be part of my operating loan?

Carl— Unfortunately, we don't know how much money you should borrow. Knowing how much you will need for margin calls implies you know where prices are going. It is this exact dilemma you are trying to mitigate through hedging.

Estimating your loan requirement

Carl— But you're right, Fred. A person who hedges does need to estimate their potential loan requirement. One method is to focus on the worst case relative to your hedged position. For example, let's say you want to hedge 195 head of 677-pound feeder steers, or 1,320 cwt. This would equal about three feeder cattle contracts.

Fred— How much could price increase?

Carl— Let's say you think the price could increase $20/cwt. This would be a $26,400 loss in the futures market. You would need to borrow this amount to meet your margin calls. You also think if you borrow, it would be for only 3 months. At 12% per year, or 3% per quarter, the interest on this would be about $800. On a hundredweight basis, this would equate to $0.60/cwt.

Fred— Obviously, you don't know if prices will increase, but you need to plan and budget this cost into your net hedge price estimate.

EXPECTED HEDGE PRICE

April feeder contract	$78.50
Expected basis	+ 3.00
Fees & interest	– 0.40
Expected cash price	$81.10
Price objective	$80.00

Carl— That's right. Now to answer your second question, I suggest you have a hedging operating loan approved in case it is needed. This loan may be part of your operating loan, but it really depends on each individual operating agreement between the lender and the customer.

Fred— Thanks, Carl.

You may want to stop the video at this point and review the use of basis to make cash price projections or to calculate a hedge price.

STOP 3

(pause)

Using basis to calculate minimum or maximum prices

Fred— We have shown that using futures market contract prices for information or pricing requires the use of the right basis. The same type of basis information is essential for the effective use of commodity option contracts in estimating minimum or maximum prices for commodities. Kim, would you explain the relationship between the basis and option contracts?

Kim— Be glad to, Fred. When you are considering the use of commodity options, basis estimates are essential for calculating a minimum price. Using the same steer situation, assume that an $82 April Chicago Mercantile Exchange put option contract premium is $3.50/cwt. and trading fee and interest equals about $0.25/cwt.

In this situation, the minimum expected price would be the $82 strike price, plus the $3 expected basis, minus the $3.50 premium, and minus the $0.25 fee and interest. Thus, the minimum expected price would be $81.25. This is $1.25 above the target price of the steers.

Fred— How about using basis for calculating maximum prices?

Kim— Basis is used in the same manner to calculate a maximum price. For example, if you buy large quantities of feed for a livestock feeding operation, it may be profitable to buy a call option contract to establish a maximum price.

Fred— It's apparent that estimating the basis is an important step in calculating either the expected minimum or maximum price when using the options markets.

Kim— Very true, Fred.

STOP 4

EXPECTED MINIMUM PRICE

Strike price	$82.00
Expected basis	+ 3.00
Premium	– 3.50
Fees & interest	– 0.25
Expected min. price	$81.25
Price objective	$80.00

Using basis to compare prices

Fred— The most used marketing tool, besides selling in the cash market, is forward contracting. Using a futures commodity contract price and the right basis to determine what the market is offering is one method of comparing forward contract offers. Kim, how may a producer use futures prices and basis to possibly avoid selling too low or buying too high?

Kim— Fred, nothing makes me as mad as finding out that I allowed someone to take advantage of me. One of the major concerns I have when I forward contract a commodity is if the buyer knows something I don't know. Why else would he want to buy or sell a contract?

A good basis estimate and the appropriate futures contract price allows us to estimate whether the forward contract price is fair. We learned earlier how to localize the futures contract price by using the basis to determine the expected price.

Assuming basis risk with hedging

Kim— We can now compare this calculated, expected price with the forward contract offer. You should take into consideration there is basis risk associated with a hedge. For example, basis risk for livestock has been estimated to be between 2% and 4% of the expected hedge price. For $80 cattle it would be about $2.40.

Fred— How about an example?

Kim— Assume someone offers to forward contract your 675-pound steers to be delivered in April for $79/cwt. Is this a fair offer? You know the expected cash price is $81.50/cwt. and the steers could be hedged for $81.10. Thus, the buyer wants $2.10/cwt. ($81.10 – $79) to cover his basis risk. You also know a minimum price of $81.25 may be set by purchasing a put option contract.

I don't know if a $79 offer is fair. You must decide. But I do know that a $75 offer would not be fair, and an offer above $81.25 would be exceptional.

Fred— The point you've made is that use of the localized basis and appropriate futures contract price provides you some additional marketing information you can use in evaluating a cash forward contract.

STOP 5

Kim— You've got it, Fred.

PRICING OPTIONS

Forward contract	$79.00
Expected cash price	$81.50
Hedge price	$81.10
Minimum price	$81.25

TIMING SALES

1. Decide on months to evaluate
2. Collect futures contract prices
3. Collect basis estimates
4. Calculate expected price
5. Estimate carrying costs
6. Calculate expected net return

Using basis to time sales

Fred— The basis also reflects the perceived supply and demand for a commodity over time. Thus, the basis may be used to determine when to sell a commodity. Carl, how is this accomplished?

Carl— Another use of the basis is to determine when to market a storable commodity such as grain. There are several ways to determine what price the market is offering relative to the carrying costs associated with storage.

I like to break it down into six steps. The first step is simply to decide how many months in advance you want to evaluate. Second, obtain the latest futures contract prices for each contract month over the time period you have selected. For example, let's say you are willing to store grain for seven months beginning at harvest. So you list the seven months beginning with July and ending in January and match a corresponding futures contract month—the nearby contract—for each of the seven months. To complete these initial steps, obtain the latest price quotes for each of the contract months.

The third step is to collect the appropriate basis estimates for each month. A simple average basis for the past five years may be appropriate. If you like, you can be more sophisticated and estimate weekly basis. It all depends on how comfortable you are with the data and how much time and resources you plan to put into your marketing of this grain.

The fourth step is the mechanics of calculating your expected price. This is done by adjusting the futures price by your estimated basis.

The fifth step is to estimate your carrying costs per period to store the grain. Carrying costs include charges for both storage and interest. If your grain is in commercial storage, the storage cost is relatively easy to obtain. On-farm storage cost is harder to calculate. With on-farm storage cost, you must include handling, repair, utilities, shrinkage, and any quality loss. Interest cost is the current per-unit-cash price times the interest rate. For example, if the current cash price is $3/bu. and the interest rate is 12% per year or 1% per month, the interest cost per month is $0.03/bu.

The last step is to calculate an expected net return by subtracting the carrying cost from your expected price for each time period. Now let's give you an example.

	Nearby futures			Exp.
Mo.	Mo.	Price	Basis	price
Jul	Sep	$3.90	–0.30	$3.60
Aug	Sep	3.90	–0.29	3.61
Sep	Dec	4.05	–0.26	3.79
Oct	Dec	4.05	–0.25	3.80
Nov	Dec	4.05	–0.24	3.81
Dec	Mar	4.10	–0.23	3.87
Jan	Mar	4.10	–0.13	3.97

A storage example

Carl— Assume you are going to start harvesting wheat and you want to determine whether to store or sell the wheat. The current price is $3.50/bu. and you have constructed a table showing expected prices through January.

You have estimated that on-farm storage cost will be about $0.15/bu. Interest cost is expected to be about $0.035/bu. per month. Thus, the carrying cost is $0.185/bu. for the first month. This cost will increase at the rate of $0.035/bu. per month.

Storage income is expected to be negative until September when storage income is $0.035 per bushel. Storage income actually declines until January. The highest storage return is expected in January at $0.075 per bushel.

The increased return from storing the grain was a result of an increasing basis and futures contract prices. You must be able to use both the futures market and the basis to accurately calculate expected returns.

Fred— That came by us pretty fast, Carl. It may be wise to stop the video at this time and go over those figures again. We also need to review the use of basis for calculating minimum or maximum prices, for comparing prices, and for timing sales of commodities.

STOP 6

(pause)

Mo	Exp. price	Storage costs	Net price
Jun	$3.50	$0.0	$3.50
Jul	3.60	0.1825	3.4175
Aug	3.61	0.22	3.39
Sep	3.79	0.255	3.535
Oct	3.80	0.29	3.51
Nov	3.79	0.325	3.465
Dec	3.87	0.36	3.51
Jan	3.97	0.395	3.575

Understanding basis signals

Fred— I understand a combination of futures prices and basis may be used to determine if cash prices are expected to increase or decrease. It follows that futures prices and basis also may be used to determine which marketing strategies to evaluate. Dr. Anderson will review these uses of the basis with respect to grains.

Kim— Fred, I believe you'll find this to be a very valuable marketing tool. You may use the basis and futures contract price as an indicator of which marketing alternatives to use. You'll recall our earlier basis formula: *basis = cash price – futures.*

Let's rearrange the formula so that: *basis + futures price = cash price.*

Selecting marketing strategies

Kim— Basis signals are generally interpreted in unison with the futures price level. The possible combinations are weak, normal, and strong basis with low, normal, or high

BASIS: Weak
FUTURES PRICE: Low
ACTION:

- Stay unpriced
- Deferred price contract
- Government loan

BASIS: Weak
FUTURES PRICE: High
ACTION:

- Storage hedge
- Remain unpriced
- Be cautious on forward contract

BASIS: Normal
FUTURES PRICE: Normal
ACTION:

- Buy put options
- Sell grain/buy call options
- Stagger sales

BASIS: Strong
FUTURES PRICE: Low
ACTION:

- Sell cash
- Sell cash/buy call options

BASIS: Strong
FUTURES PRICE: High
ACTION:

- Sell cash
- Forward contract
- Be cautious on hedging

futures price. Let's take a look at some of these combinations, shall we?

First, let's say you're facing a weak basis and a low futures price. This means one or both would be expected to increase. The actions you could consider in this case would be staying unpriced, using a deferred price contract, or placing grain in a government loan.

If the basis is weak and the futures price is high, the basis may strengthen. Depending on market conditions, the futures price may stay steady or move lower. Thus, the appropriate marketing alternatives may include a storage hedge to capture basis gain and protect against a falling futures price. Or, if the odds indicate that the futures price may increase, you could remain unpriced. Very rarely in this case would you forward contract.

If you have a normal basis and a normal futures price, prices could go up, down, or sideways. The choices to consider may be to buy put option contracts, sell the grain and buy call option contracts, or stagger your sales.

If the basis is strong and the futures price is low, you may want to consider selling cash or selling cash and buying call options.

With a strong basis and a high futures price, sell cash and enjoy the relatively high price. With a strong basis and high futures price, you may want to forward contract. But because of basis risk, you probably do not want to hedge.

Fred— Kim, that's a lot of information in a very short time. Let's stop the video and rely on your facilitator to answer questions and assist in some exercises to review some of these important uses of basis.

(pause)

Predicting basis risk

Fred— I'm sure it's no surprise to you that basis can not be predicted with 100% accuracy. Thus, there is risk that the expected price calculated with the basis estimate will be lower than expected. Research has been conducted to estimate the risk associated with basis estimates. Kim Anderson joins me now to address the subject of basis risk.

Kim, my understanding is that when you place a futures hedge or use futures option contracts as pricing tools, basis risk replaces price risk.

Kim— That's correct, Fred. Basis risk is the risk that the actual basis will be less than expected. Or, another way to define basis risk is the odds of a basis being weaker than expected.

But you must be careful you do not try to cope with basis risk by underestimating the basis. This could result in a missed opportunity to effectively price your product.

Fred— How do you measure basis risk?

Measuring basis risk

Kim— One way is to measure how much the basis has varied over some period of time. The measurement used most often is the standard deviation. The standard deviation is a statistical measure of variability. Adding and subtracting the basis standard deviation to and from the expected basis yields a basis range that contains the actual basis two-thirds of the time.

Fred— You've left me behind, Kim. How about an example?

Kim— Let's say the average basis in April for 600- to 700-pound steers using the April feeder contracts is $3. The standard deviation for this basis is $1.20; so, we add and subtract this figure from the $3 average basis. This implies that two-thirds of the time the April basis for 600- to 700-pound steers has been between $4.20 and $1.80/cwt.

We could also use the same procedure with an expected basis rather than an average basis. For example, assume you are hedging cattle at an expected net price of $81.10. If the expected basis standard deviation is $1.20, two-thirds of the time the actual net price is expected to be between $82.30 and $79.90, or $81.10 plus and minus $1.20.

Fred— Now we know what the basis risk is. Can we compare that to what the cash price risk might be?

Basis risk vs. price risk

Kim— Sure, the magnitude of basis and cash price risk change by location and the type and weight of the commodity. In the case of feeder steers that meet contract specs, we said the basis risk was about $1.20/cwt. In contrast, cash price risk for the next six months may be about 15% of the expected cash price.

Fred— Can you give us an example, Kim?

Kim— Let's look at the same feeder steer example. The price is expected to be $81.50. You calculate 15% of $81.50 and subtract and add the result. As you can see, the expected price range would be between $69.25 and $93.75 two-thirds of the time. So the cash market risk is much

BASIS RISK

The basis plus and minus one (1) standard deviation creates a range that includes the actual basis two-thirds of the time.

BASIS RISK

Basis plus and minus one standard deviation

$3.00	$3.00
+ 1.20	− 1.20
$4.20	$1.80

CASH PRICE RISK

$81.50	$81.50	$81.50
X 0.15	− 12.25	+ 12.25
$12.25	$69.25	$93.75

CASH VS. BASIS RISK

Cash
$69.25 ◄——► $93.75

Basis
$79.90 ◄——► $82.30

greater than with the potential net hedged price range of $79.90 to $82.30 which we calculated earlier.

Fred— What happens if the commodity being sold varies greatly from the contract specifications?

Kim— In general, the more a commodity differs from futures contract specs, the higher the basis risk. For example, the Chicago Mercantile Exchange feeder cattle contract specs are for 600- to 800-pound steers. In a recent study, the basis standard deviation at one market for 700- to 800-pound steers was $1.07/cwt. while the basis standard deviation for 600- to 700-pound heifers was $2.78/cwt. The standard deviation for 400- to 500-pound steers was $3.59.

Fred— Is it possible for basis risk to be as high as cash price risk?

Kim— Yes, there are situations where the basis risk is as high as or greater than the cash price risk. But this only occurs when the commodity does not meet contract specifications.

One example is short-staple cotton raised in the Texas high plains. The New York cotton contract is for a long-staple cotton. Factors affecting the price of short-staple cotton may have little influence on the price of long-staple cotton. Thus, the New York futures cotton contract price may not react in a predictable manner relative to short-staple cotton cash prices.

Fred— It appears to be important that you know how much risk is associated with the basis estimate.

Kim— Yes. The risk may be so high that little is gained by hedging your production. However, for the major commodities covered by the commodity exchanges, the use of hedging and options is an important price risk management tool.

Fred— Thank you, Kim. Except for our summary statement, this concludes our basis video. I suggest you stop the video at this point and complete the exercises on basis risk.

STOP 8

(pause)

Summary

Fred— It is time to summarize what we have learned in this module. At the outset, we quickly established the essential nature of basis and defined it using a basic formula: *cash price – futures price.*

We then explored the use of basis in our marketing decisions such as estimating expected cash prices, hedge prices, and maximum and minimum prices. We also learned how to use basis to assess the value of forward cash contracts and how to use basis to time sales a commodity.

However, in all this we discovered there is a risk attached to the use of basis. But we also found that in most cases, it is much less than dealing with cash price risk. As a farm manager, you should now have a better appreciation for the key role that basis plays in marketing. Hopefully, you will be able to more easily decide whether or not to accept a given price, whether or not to store a commodity, and whether, when and what delivery month to hedge. Basis is also a crucial element in the use of commodity options. After all, these are very important marketing decisions that any farm manager must make. Good luck in your marketing endeavors.

References

Each of the following organizations provide informational materials concerning futures, options and related topics. For a brief description of these materials and an order form, write:

Chicago Board of Trade
Literature Services Department
LaSalle at Jackson
Chicago, IL 60604

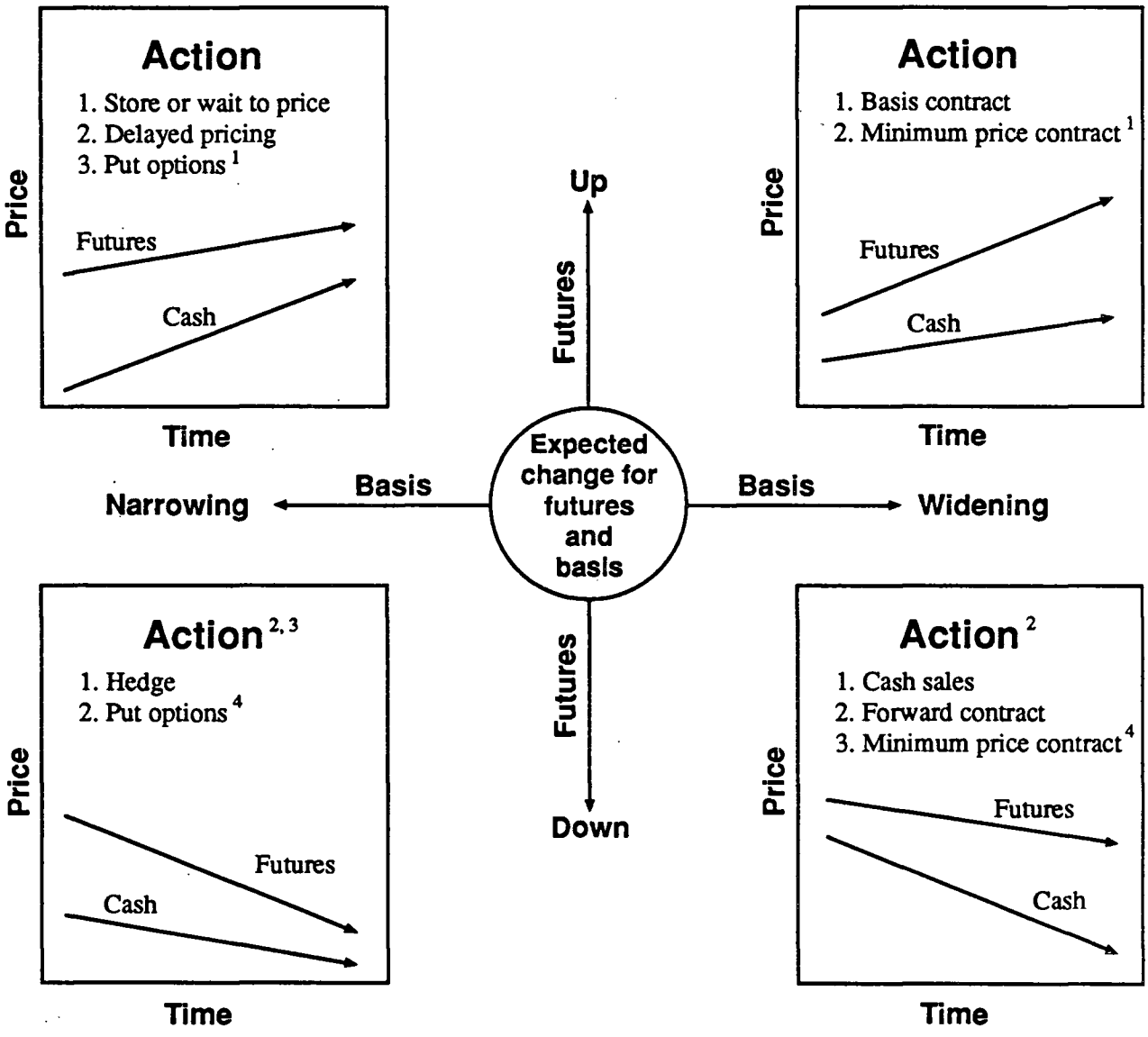
Chicago Mercantile Exchange
Office Services Department
30 S. Wacker Drive
Chicago, IL 60606

National Futures Association
Public Affairs
P.O. Box 98383
Chicago, IL 60693

Commodity Futures Trading Commission
Office of Communication and Education Services
2033 K Street, N.W.
Washington, D.C. 20581

Appendix 1

Pricing decision chart for crops



[1] Best if futures fall; worst if futures rise or remain stable.

[2] Action to be considered if the price level is satisfactory and well above government loan rates.

[3] Basis should exceed storage costs plus normal basis near delivery for any storage period involved.

[4] Best if futures rise; worst if futures fall or remain stable.

Adapted from Ferris, John. December 1985, *Developing Marketing Strategies and Keeping Records on Corn, Soybeans and Wheat*. NCR Extension Publication No. 217, Producer Marketing Management—Fact Sheet #4, Cooperative Extension Service of Michigan State University, p. 12.

Exercise 1

Video questions

Indicate whether each of the following statements is true (T) or false (F).

T F 1. *Basis* refers to the difference between any two prices.

T F 2. It doesn't make any difference which commodity exchange you're using, basis will be the same as long as the commodity is the same.

T F 3. Every agricultural commercial user of futures or options must consider the delivery month, location, and quality of their product when estimating the basis.

T F 4. History has shown that the best predictor of agricultural commodity prices is the commodity futures market.

T F 5. A producer who hedges using the futures market and/or the options market is substituting basis risk for price risk.

T F 6. Combining price quotations from the futures market with localized basis information can provide a good evaluation of forward cash contract offers.

T F 7. Basis can be used as a predictor of supply and demand for a commodit, and therefore can be helpful in determining when to sell a storable commodity.

T F 8. The primary carrying costs of storing a commodity are (1) storage, (2) interest, and (3) insurance. Basis will always reflect these costs.

T F 9. Futures and basis can be used to determine if cash prices are expected to increase or decrease.

T F 10. In general, the more a commodity differs from the specifications of the futures contract, the higher the basis risk.

Exercise 2a

Calculating an expected hedge price: hog example

Assumptions

- A hog producer expects to raise 261 head of slaughter hogs weighing 230 lbs. on April 1.
- The current date is November 1.
- Variable costs of production are $41/cwt.
- The producer's profit objective is $10/cwt.
- The April 1 basis is expected to be $2/cwt. under the CME April hog futures contract.
- The CME April hog contract (30,000 lbs.) is currently trading at $52/cwt.
- The producer expects the worst price increase would be $5/cwt.
- Brokerage fees are $90 per contract.
- Interest costs on borrowed funds are 12% per year.

Determine

1. Calculate the producer's price objective.

2. Calculate the expected hedge price including transaction costs.

3. If the hogs are sold on April 1 in the local cash market for $54/cwt. and the CME April hog futures contract is trading for $56/cwt.:

   a. What is the actual basis?

   b. What is the net price received?

Exercise 2b

Calculating an expected hedge price: corn example

Assumptions

- A corn producer expects to raise 10,000 bu. of corn for October delivery.
- The current date is July 1.
- Variable costs of production are $2.10/bu.
- The producer's profit objective is $0.30/bu.
- An October 1 basis is expected to be $0.30/bu. under the CBT December corn futures contract.
- The CBT December corn contract (5,000 bu.) is currently trading at $2.60/bu.
- The producer expects the worst price increase would be $0.30/bu.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $50 per contract.

Determine

1. Calculate the producer's price objective.

2. Calculate the expected hedge price including transaction costs.

3. If the corn is sold on October 1 in the local cash market for $2.50/bu. and the CBT December corn futures contract is trading for $2.80/bu.:

   a. What is the actual basis?

   b. What is the net price received?

Exercise 2c

Calculating an expected hedge price: feeder cattle example

Assumptions

- A rancher expects to market 130 steers weighing 675 lbs. for April 1 delivery.
- The current date is November 15.
- Variable costs of production are $52/cwt.
- The producer's profit objective is $10/cwt.
- The April 1 basis is expected to be $1/cwt. over the CME April feeder cattle futures contract.
- The CME April feeder cattle contract (44,000 lbs.) is currently trading at $64/cwt.
- The producer expects the worst price increase would be $10/cwt.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $88 per contract.

Determine

1. Calculate the producer's price objective.

2. Calculate the expected hedge price including transaction costs.

3. If the steers are sold on April 1 in the local cash market for $70/cwt. and the CME April feeder cattle futures contract is trading for $69/cwt.:

   a. What is the actual basis?

   b. What is the net price received?

Exercise 3a

Calculating an expected minimum price: live cattle put example

Assumptions

- A cattle producer is custom feeding 110 head of steers estimated to weigh 1,100 lbs. on September 15.
- The current date is June 1.
- Variable costs of production are $53/cwt.
- The producer's profit objective is $5/cwt.
- The September 15 basis is expected to be $1/cwt. under the CME October live cattle futures contract.
- The CME October live cattle futures contract (40,000 lbs.) is currently trading at $62/cwt.
- A CME October live cattle $62 put option contract can be purchased for $2.50/cwt.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $80 per contract.

Determine

1. Calculate the producer's price objective.

2. Calculate the expected minimum price including transaction costs.

3. Assume a CME October live cattle $62 put was purchased on June 1 for $2.50/cwt. and the cattle are being sold on September 15. If the September 15 live cattle cash market is $58/cwt. and a CME October live cattle futures contract is trading for $59/cwt.:

   a. What is the actual basis?

   b. What is the net price received?

Exercise 3b

Calculating an expected minimum price: feeder cattle put example

Assumptions

- A rancher expects to produce 130 head of steers estimated to weigh 675 lbs. on April 1.
- The current date is December 15.
- Variable costs of production are $52/cwt.
- The producer's profit objective is $10/cwt.
- The April 1 basis is expected to be $1/cwt. over the CME April feeder cattle futures contract.
- The CME April feeder cattle futures contract (44,000 lbs.) is currently trading at $64/cwt.
- A CME April feeder cattle $64 put option contract can be purchased for $2.50/cwt.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $88 per contract.

Determine

1. Calculate the producer's price objective.

2. Calculate the expected minimum price including transaction costs.

3. Assume a CME April feeder cattle $64 put was purchased on December 15 for $2.50/cwt. and the cattle are being sold on April 1. If the April 1 feeder cattle cash market is $59/cwt. and a CME April feeder cattle futures contract is trading for $58/cwt.:

   a. What is the actual basis?

   b. What is the net price received?

Exercise 3c

Calculating an expected minimum price: hog put example

Assumptions

- A hog producer expects to raise 261 head of hogs estimated to weigh 230 lbs. on April 15.
- The current date is December 15.
- Variable costs of production are $41/cwt.
- The producer's profit objective is $10/cwt.
- The local April 15 basis is expected to be $2/cwt. under the CME June hog futures contract.
- The CME June hog futures contract (30,000 lbs.) is currently trading at $52/cwt.
- A CME June hog $52 put option contract can be purchased for $2.25/cwt.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $60 per contract.

Determine

1. Calculate the producer's price objective.

2. Calculate the expected minimum price including transaction costs.

3. Assume a CME June hog $52 put was purchased on December 15 for $2.25/cwt. and the cattle are being sold on April 15. If the April 15 hog cash market is $46/cwt. and a CME June hog futures contract is trading for $48/cwt.:

   a. What is the actual basis?

   b. What is the net price received?

Exercise 3d

Calculating an expected minimum price: corn put example

Assumptions

- A corn producer is raising 10,000 bu. of corn for October 15 delivery.
- The current date is July 15.
- Variable costs of production are $2.10/bu.
- The producer's profit objective is $0.30/bu.
- The October 15 basis is expected to be $0.30/bu. under the CBT December corn futures contract.
- The CBT December corn futures contract (5,000 bu.) is currently trading at $2.60/bu.
- A CBT December corn $2.60 put option contract can be purchased for $0.15/bu.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $50 per contract.

Determine

1. Calculate the producer's price objective.

2. Calculate the expected minimum price including transaction costs.

3. Assume a CBT December corn $2.60 put was purchased on July 15 for $0.15/bu. and the corn is being sold on October 15. If the October 15 corn cash market is $2.10/bu. and a CBT December corn futures contract is trading for $2.40/bu.:

   a. What is the actual basis?

   b. What is the net price received?

Exercise 4

Calculating a maximum price: corn call example

Assumptions

- A hog producer plans to purchase 10,000 bu. of corn for October 15 delivery.
- The current date is July 15.
- The October 15 basis is expected to be $0.30/bu. under the CBT December corn futures contract.
- The CBT December corn futures contract (5,000 bu.) is currently trading at $2.60/bu.
- A CBT December corn $2.60 call option contract can be purchased for $0.15/bu.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $50 per contract.

Determine

1. Calculate the expected maximum price including transaction costs.

2. Assume a CBT December corn $2.60 call was purchased on July 15 for $0.15/bu. and the corn is being purchased on October 15. If the October 15 corn cash market is $2.50/bu. and a CBT December corn futures contract is trading for $2.80/bu.:

   a. What is the actual basis?

   b. What is the net price received?

Exercise 5

Using basis in timing sales

Assumptions

- A soybean producer plans to raise 15,000 bu. of soybeans.
- On-farm storage is available for all the soybeans.
- The current date is August 15 and the producer wants to protect the soybean selling price.
- The producer's marketing price objective for the soybeans is $7.15/bu.
- Current short-term interest rate is 10% making the cost to carry (storage, insurance and interest) the soybeans about $0.09/bu. per month.
- Commission costs are $50 per contract for each hedge placed and lifted.

Determine

1. Assume these futures market prices on August 15.

Nov	Jan	Mar	May	July	Aug
7.50	7.81	7.92	7.99	8.15	8.20

   a. Calculate the *spread* or *revenue side of the equation* to determine the month with the best spread.

   Nov – Jan _____

   Nov – Mar _____

   Nov – May _____

   Nov – July _____

   Nov – Aug _____

   b. What is the best revenue month (best spread)?

2. a. Determine the net return to farm storage or *cost side of the equation* by calculating cost of farm storage and net return to farm storage.

	Spread	(–)	Cost of on-farm storage	=	Net return to storage
Nov - Jan	_____		_____		_____
Nov - Mar	_____		_____		_____
Nov - May	_____		_____		_____
Nov - July	_____		_____		_____
Nov - Aug	_____		_____		_____

b. Which futures month or months will it pay to store the soybeans?

c. Where is the best return to farm storage?

3. Adjust this by forecasting and selecting the most favorable local basis from historical data given or by cost calculation.

Calendar month	Basis	Contract month	Calendar month	Basis	Contract month
Nov	–0.40	Jan	Apr	–0.31	May
Dec	–0.20	Jan	May	–0.38	July
Jan	–0.25	Mar	June	–0.22	July
Feb	–0.28	Mar	July	–0.27	Aug
Mar	–0.30	May	Aug	–0.29	Sept

Which is the most favorable basis month? _____

4. In which futures month should the hedge be placed? _____

5. Assuming the producer hedged on August 15, use a T-account to show his or her position in the cash and futures markets.

Cash	Futures	Basis

6. Does the producer's expected price cover his or her marketing price objective and storage costs?

7. It is now December 29, and futures prices are trading at $7.60/bu. The local cash price is $7.41/bu. The hedge is closed out. What is the net selling price per bushel?

8. Suppose in the previous example the expected basis of $0.20/bu. under never materialized and on December 29 cash prices were $7.05/bu. and futures were at $7.60/bu. Would the producer have met his or her market price objective and covered storage costs?

9. Assume the producer decides not to sell cash soybeans on December 29 and wants to protect the selling price. What action can be taken?

10. Use the previous historical basis table and storage charges of $0.09/bu. per month and the following futures prices. Calculate the spread, cost for farm storage and net return to storage.

Month	Futures price	Spread	Cost farm storage	Net return to storage
Jan	7.60	_____	_____	_____
Mar	7.72	_____	_____	_____
May	7.86	_____	_____	_____
July	8.20	_____	_____	_____
Aug	8.22	_____	_____	_____

Into which month should the producer roll the hedge? _____

11. Let's assume on December 29 the producer rolled the hedge from the January option into the July at $8.20/bu. It is now June 28 and the basis has improved from its December low of $0.55 under to its current level of $0.20 under. If July futures are trading at $8.38/bu., what is the outcome of the hedge after rolling into the July option?

Answer key 1

Video questions

Indicate whether each of the following statements is true (T) or false (F).

(T) F 1. *Basis* refers to the difference between any two prices.

T (F) 2. It doesn't make any difference which commodity exchange you're using, basis will be the same as long as the commodity is the same.

Comment: False. Basis calculated using the Kansas City Board of Trade July wheat contract price is not the same as a basis calculated using the Chicago Board of Trade July wheat contract price.

(T) F 3. Every agricultural commercial user of futures or options must consider the delivery month, location, and quality of their product when estimating the basis.

T (F) 4. History has shown that the best predictor of agricultural commodity prices is the commodity futures market.

Comment: False. It is a good predictor but research has shown that there are no significant differences between most systems that are commonly used to forecast agricultural prices.

(T) F 5. A producer who hedges using the futures market and/or the options market is substituting basis risk for price risk.

(T) F 6. Combining price quotations from the futures market with localized basis information can provide a good evaluation of forward cash contract offers.

(T) F 7. Basis can be used as a predictor of supply and demand for a commodity and therefore can be helpful in determining when to sell a storable commodity.

T (F) 8. The primary carrying costs of storing a commodity are (1) storage, (2) interest, and (3) insurance. Basis will always reflect these costs.

Comment: False. The cost of carrying the commodities will be reflected in the basis. However, basis will also reflect *expectations* of other factors that affect supply and demand. In a volatile market (e.g., a weather-related market), expectations may be the most important factor influencing basis.

(T) F 9. Futures and basis can be used to determine if cash prices are expected to increase or decrease.

(T) F 10. In general, the more a commodity differs from the specifications of the futures contract, the higher the basis risk.

Answer key 2a

Calculating an expected hedge price: hog example

Assumptions

- A hog producer expects to raise 261 head of slaughter hogs weighing 230 lbs. on April 1.
- The current date is November 1.
- Variable costs of production are $41/cwt.
- The producer's profit objective is $10/cwt.
- The April 1 basis is expected to be $2/cwt. under the CME April hog futures contract.
- The CME April hog contract (30,000 lbs.) is currently trading at $52/cwt.
- The producer expects the worst price increase would be $5/cwt.
- Brokerage fees are $90 per contract.
- Interest costs on borrowed funds are 12% per year.

Determine

1. Calculate the producer's price objective.
   The producer's price objective is **$51** ($41 variable cost [VC] + $10 profit objective).

2. Calculate the expected hedge price including transaction costs.
   The producer's expected hedge price is **$49.45**.

Futures price	$52.00	
Expected basis	– 2.00	
Brokerage fees	– 0.30	($90 per 300 cwt.)
Exp. interest costs	– 0.25	($5 X 0.01 interest X 5 months)
Expected hedge price	**$49.45**	

3. If the hogs are sold on April 1 in the local cash market for $54/cwt. and the CME April hog futures contract is trading for $56/cwt.:

   a. What is the actual basis?
   The actual basis is the expected $2 under or **–$2.00** ($54 cash – $56 futures). However, it is unusual that a person can predict the basis this accurately. One should expect basis risk.

   b. What is the net price received?
   The net price received will be **$49.70 minus an unknown interest fee.**

Cash sale	$54.00	
Futures loss	– 4.00	(Sold April hog contract at $52 and bought at $56)
Brokerage fee	– 0.30	
Net price	**$49.70**	**minus interest charges on the futures margin account.** Because this account will vary over the five-month period and we do not know the magnitude of this variation, we can not calculate that charge.

Answer key 2b

Calculating an expected hedge price: corn example

Assumptions

- A corn producer expects to raise 10,000 bu. of corn for October delivery.
- The current date is July 1.
- Variable costs of production are $2.10/bu.
- The producer's profit objective is $0.30/bu.
- An October 1 basis is expected to be $0.30/bu. under the CBT December corn futures contract.
- The CBT December corn contract (5,000 bu.) is currently trading at $2.60/bu.
- The producer expects the worst price increase would be $0.30/bu.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $50 per contract.

1. Calculate the producer's price objective.
   The producer's price objective is **$2.40** ($2.10 VC + $0.30 profit objective).

2. Calculate the expected hedge price including transaction costs.
   The producer's expected hedge price is **$2.28**.

Futures price	$ 2.60	
Expected basis	– 0.30	
Brokerage fees	– 0.01	($50 per 5000 bu.)
Exp. interest costs	– 0.01	($0.30 X 0.01 interest X 3 months)
Expected hedge price	**$ 2.28**	

3. If the corn is sold on October 1 in the local cash market for $2.50/bu. and the CBT December corn futures contract is trading for $2.80/bu.:

   a. What is the actual basis?
      The actual basis is the expected $0.30 under, or **–$0.30** ($2.50 cash – $2.80 futures). However, it is unusual that a person can predict the basis this accurately. One should expect basis risk.

   b. What is the net price received?
      The net price received will be **$2.29 minus an unknown interest fee.**

Cash sale	$ 2.50	
Futures loss	– 0.20	(Sold Dec. corn contract at $2.60 and bought at $2.80)
Brokerage fee	– 0.01	
Net price	**$ 2.29**	**minus interest charges on the futures margin account.** Because this account will vary over the three-month period and we do not know the magnitude of this variation, we can not calculate that charge.

Answer key 2c

Calculating an expected hedge price: feeder cattle example

Assumptions

- A rancher expects to market 130 steers weighing 675 lbs. for April 1 delivery.
- The current date is November 15.
- Variable costs of production are $52/cwt.
- The producer's profit objective is $10/cwt.
- The April 1 basis is expected to be $1/cwt. over the CME April feeder cattle futures contract.
- The CME April feeder cattle contract (44,000 lbs.) is currently trading at $64/cwt.
- The producer expects the worst price increase would be $10/cwt.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $88 per contract.

Determine

1. Calculate the producer's price objective.
   The producer's price objective is **$62** ($52 variable cost [VC] + $10 profit objective).

2. Calculate the expected hedge price including transaction costs.
   The producer's expected hedge price is **$64.35.**

Futures price	$64.00	
Expected basis	+ 1.00	
Brokerage fees	– 0.20	($88 per 440 cwt.)
Exp. interest costs	– 0.45	($10 X 0.01 interest X 4.5 months)
Expected hedge price	**$64.35**	

3. If the steers are sold on April 1 in the local cash market for $70/cwt. and the CME April feeder cattle futures contract is trading for $69/cwt.:

   a. What is the actual basis?
   The actual basis is the expected $1 over, or **+$1.00** ($70 cash – $69 futures). However, it is unusual that a person can predict the basis this accurately. One should expect basis risk.

   b. What is the net price received?
   The net price received will be **$64.80 minus an unknown interest fee.**

Cash sale	$70.00	
Futures loss	– 5.00	(Sold April FC contract at $64 and bought at $69)
Brokerage fee	– 0.20	
Net price	**$64.80**	**minus interest charges on the futures margin account.** Because this account will vary over the 4.5-month period and we do not know the magnitude of this variation, we can not calculate that charge.

Answer key 3a

Calculating an expected minimum price: live cattle put example

Assumptions

- A cattle producer is custom feeding 110 head of steers estimated to weigh 1,100 lbs. on September 15.
- The current date is June 1.
- Variable costs of production are $53/cwt.
- The producer's profit objective is $5/cwt.
- The September 15 basis is expected to be $1/cwt. under the CME October live cattle futures contract.
- The CME October live cattle futures contract (40,000 lbs.) is currently trading at $62/cwt.
- A CME October live cattle $62 put option contract can be purchased for $2.50/cwt.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $80 per contract.

Determine

1. Calculate the producer's price objective.
   The producer's price objective is $58 ($53 variable cost [VC] + $5 profit objective).

2. Calculate the expected minimum price including transaction costs.
   The producer's expected minimum price is **$58.21**.

Strike price	$62.00	
Premium	– 2.50	
Expected basis	– 1.00	
Brokerage fees	– 0.20	($80 per 400 cwt.)
Exp. interest costs	– 0.09	($2.50 premium X 0.01 interest X 3.5 months)
Expected minimum price	**$58.21**	

3. Assume a CME October live cattle $62 put was purchased on June 1 for $2.50/cwt. and the cattle are being sold on September 15. If the September 15 live cattle cash market is $58/cwt. and a CME October live cattle futures contract is trading for $59/cwt.:

   a. What is the actual basis?
   The actual basis is the expected $1 under or **–$1.00** ($58 cash – $59 futures). However, it is unusual that a person can predict the basis this accurately. One should expect basis risk.

   b. What is the net price received? The net price received will be **$58.21**.

Cash sale	$58.00	
Premium paid	– 2.50	
Intrinsic value	+ 3.00	($62 strike – $59 futures)
Brokerage fee	– 0.20	
Interest costs	– 0.09	
Net price	**$58.21**	

Answer key 3b

Calculating an expected minimum price: feeder cattle put example

Assumptions

- A rancher expects to produce 130 head of steers estimated to weigh 675 lbs. on April 1.
- The current date is December 15.
- Variable costs of production are $52/cwt.
- The producer's profit objective is $10/cwt.
- The April 1 basis is expected to be $1/cwt. over the CME April feeder cattle futures contract.
- The CME April feeder cattle futures contract (44,000 lbs.) is currently trading at $64/cwt.
- A CME April feeder cattle $64 put option contract can be purchased for $2.50/cwt.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $88 per contract.

Determine

1. Calculate the producer's price objective.
   The producer's price objective is **$62** ($52 variable cost [VC] + $10 profit objective).

2. Calculate the expected minimum price including transaction costs.
   The producer's expected minimum price is **$62.21**.

Strike price	$64.00	
Premium	– 2.50	
Expected basis	+ 1.00	
Brokerage fees	– 0.20	($88 per 440 cwt.)
Exp. interest costs	– 0.09	($2.50 premium X 0.01 interest X 3.5 months)
Expected minimum price	**$62.21**	

3. Assume a CME April feeder cattle $64 put was purchased on December 15 for $2.50/cwt. and the cattle are being sold on April 1. If the April 1 feeder cattle cash market is $59/cwt. and a CME April feeder cattle futures contract is trading for $58/cwt.:

   a. What is the actual basis?
   The actual basis is the expected $1 over, or **+$1.00** ($59 cash – $58 futures). However, it is unusual that a person can predict the basis this accurately. One should expect basis risk.

   b. What is the net price received? The net price received will be **$62.21.**

Cash sale	$59.00	
Premium paid	– 2.50	
Intrinsic value	+ 6.00	($64 strike – $58 futures)
Brokerage fee	– 0.20	
Interest costs	– 0.09	
Net price	**$62.21**	

Answer key 3c

Calculating an expected minimum price: hog put example

Assumptions

- A hog producer expects to raise 261 head of hogs estimated to weigh 230 lbs. on April 15.
- The current date is December 15.
- Variable costs of production are $41/cwt.
- The producer's profit objective is $10/cwt.
- The local April 15 basis is expected to be $2/cwt. under the CME June hog futures contract.
- The CME June hog futures contract (30,000 lbs.) is currently trading at $52/cwt.
- A CME June hog $52 put option contract can be purchased for $2.25/cwt.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $60 per contract.

Determine

1. Calculate the producer's price objective.
   The producer's price objective is **$51** ($41 variable cost [VC] + $10 profit objective).

2. Calculate the expected minimum price including transaction costs.
   The producer's expected minimum price is **$47.46.**

Strike price	$52.00	
Premium	– 2.25	
Expected basis	– 2.00	
Brokerage fees	– 0.20	($60 per 300 cwt.)
Exp. interest costs	– 0.09	($2.25 premium X 0.01 interest X 4 months)
Expected minimum price	**$47.46**	

3. Assume a CME June hog $52 put was purchased on December 15 for $2.25/cwt. and the cattle are being sold on April 15. If the April 15 hog cash market is $46/cwt. and a CME June hog futures contract is trading for $48/cwt.:

   a. What is the actual basis?
   The actual basis is the expected $2 under, or **–$2.00** ($46 cash – $48 futures). However, it is unusual that a person can predict the basis this accurately. One should expect basis risk.

   b. What is the net price received? The net price received will be **$47.46.**

Cash sale	$46.00	
Premium paid	– 2.25	
Intrinsic value	+ 4.00	($52 strike – $48 futures)
Brokerage fee	– 0.20	
Interest costs	– 0.09	
Net price	**$47.46**	

Answer key 3d

Calculating an expected minimum price: corn put example

Assumptions

- A corn producer is raising 10,000 bu. of corn for October 15 delivery.
- The current date is July 15.
- Variable costs of production are $2.10/bu.
- The producer's profit objective is $0.30/bu.
- The October 15 basis is expected to be $0.30/bu. under the CBT December corn futures contract.
- The CBT December corn futures contract (5,000 bu.) is currently trading at $2.60/bu.
- A CBT December corn $2.60 put option contract can be purchased for $0.15/bu.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $50 per contract.

Determine

1. Calculate the producer's price objective.
   The producer's price objective is **$2.40** ($2.10 variable cost [VC] + $0.30 profit objective).

2. Calculate the expected minimum price including transaction costs.
   The producer's expected minimum price is **$2.14**.

Strike price	$ 2.60	
Premium	– 0.15	
Expected basis	– 0.30	
Brokerage fees	– 0.01	($50 per 5000 bu.)
Exp. interest costs	– 0.00	(less than 1/2 cent)
		($0.15 premium X 0.01 interest X 3 months)
Expected minimum price	**$ 2.14**	

3. Assume a CBT December corn $2.60 put was purchased on July 15 for $0.15/bu. and the corn is being sold on October 15. If the October 15 corn cash market is $2.10/bu. and a CBT December corn futures contract is trading for $2.40/bu.:

   a. What is the actual basis?
   The actual basis is the expected $0.30 under, or **–$0.30** ($2.10 cash – $2.40 futures). However, it is unusual that a person can predict the basis this accurately. One should expect basis risk.

   b. What is the net price received? The net price received will be **$2.14**

Cash sale	$ 2.10	
Premium paid	– 0.15	
Intrinsic value	+ 0.20	($2.60 strike – $2.40 futures)
Brokerage fee	– 0.01	
Interest costs	– 0.00	
Net price	**$ 2.14**	

Answer key 4

Calculating a maximum price: corn call example

Assumptions

- A hog producer plans to purchase 10,000 bu. of corn for October 15 delivery.
- The current date is July 15.
- The October 15 basis is expected to be $0.30/bu. under the CBT December corn futures contract.
- The CBT December corn futures contract (5,000 bu.) is currently trading at $2.60/bu.
- A CBT December corn $2.60 call option contract can be purchased for $0.15/bu.
- Interest costs on borrowed funds are 12% per year.
- Brokerage fees are $50 per contract.

Determine

1. Calculate the expected maximum price including transaction costs.
   The producer's expected maximum price is **$2.46**.

Strike price	$ 2.60	
Premium	+ 0.15	
Expected basis	– 0.30	
Brokerage fees	+ 0.01	($50 per 5000 bu.)
Exp. interest costs	– 0.00	(less than 1/2 cent)
		($0.15 premium X 0.01 interest X 3 months)
Expected minimum price	**$ 2.46**	

2. Assume a CBT December corn $2.60 call was purchased on July 15 for $0.15/bu. and the corn is being purchased on October 15. If the October 15 corn cash market is $2.50/bu. and a CBT December corn futures contract is trading for $2.80/bu.:

   a. What is the actual basis?
   The actual basis is the expected $0.30 under, or **–$0.30** ($2.50 cash – $2.80 futures). However, it is unusual that a person can predict the basis this accurately. One should expect basis risk.

   b. What is the net price received?
   The net price received will be **$2.46**.

Cash price paid	$ 2.50	
Premium paid	+ 0.15	
Intrinsic value	– 0.20	($2.60 strike – $2.80 futures)
Brokerage fee	+ 0.01	
Interest costs	+ 0.00	
Net price	**$ 2.46**	

Answer key 5

Using basis in timing sales

Assumptions

- A soybean producer plans to raise 15,000 bu. of soybeans.
- On-farm storage is available for all the soybeans.
- The current date is August 15 and the producer wants to protect the soybean selling price.
- The producer's marketing price objective for the soybeans is $7.15/bu.
- Current short-term interest rate is 10% making the cost to carry (storage, insurance and interest) the soybeans about $0.09/bu. per month.
- Commission costs are $50 per contract for each hedge placed and lifted.

Determine

1. Assume these futures market prices on August 15.

Nov	Jan	Mar	May	July	Aug
7.50	7.81	7.92	7.99	8.15	8.20

   a. Calculate the *spread* or *revenue side of the equation* to determine the month with the best spread.

Nov – Jan	**$ 0.31**	($7.81 – $7.50)
Nov – Mar	**0.42**	($7.92 – $7.50)
Nov – May	**0.49**	($7.99 – $7.50)
Nov – July	**0.65**	($8.15 – $7.50)
Nov – Aug	**0.70**	($8.20 – $7.50)

   b. What is the best revenue month (best spread)? **August**

2. a. Determine the net return to farm storage or *cost side of the equation* by calculating cost of farm storage and net return to farm storage.

	Spread	(–)	Cost of on-farm storage	=	Net return to storage
Nov – Jan	**0.31**		**0.18** (0.09 X 2 mo.)		**+0.13**
Nov – Mar	**0.42**		**0.36** (0.09 X 4 mo.)		**+0.06**
Nov – May	**0.49**		**0.54** (0.09 X 6 mo.)		**–0.05**
Nov – July	**0.65**		**0.72** (0.09 X 8 mo.)		**–0.07**
Nov – Aug	**0.70**		**0.81** (0.09 X 9 mo.)		**–0.11**

   b. Which futures month or months will it pay to store the soybeans? **January and March**

   c. Where is the best return to farm storage? **November to January**

3. Adjust this by forecasting and selecting the most favorable local basis from given historical data or by cost calculation.

Calendar month	Basis	Contract month	Calendar month	Basis	Contract month
Nov	-0.40	Jan	Apr	-0.31	May
Dec	-0.20	Jan	May	-0.38	July
Jan	-0.25	Mar	June	-0.22	July
Feb	-0.28	Mar	July	-0.27	Aug
Mar	-0.30	May	Aug	-0.29	Sept

Which is the most favorable basis month? **December** (smallest basis)

4. In which futures month should the hedge be placed? **Probably January**

5. Assuming the producer hedged on August 15, use a T-account to show his or her position in the cash and futures markets.

Cash		Futures		Basis
Expected cash price	$7.61	Sell January futures @	$7.81	$0.20
Anticipated storage cost for 2 months @ $0.09	– 0.18			
Commission	– 0.01			
Net	**$7.42**			

6. Does the producer's expected price cover his or her marketing price objective and storage costs? **Yes. The expected $7.42 price is $0.27 over the $7.15 price objective.**

7. It is now December 28, and futures prices are trading at $7.60/bu. The local cash price is $7.41/bu. The hedge is closed out. What is the net selling price per bushel? **$7.43**

Cash		Futures		Basis
Aug 15		*Aug 15*		
Expected cash price	$7.61	Sell January futures	$7.81	–$0.20
Dec 28		*Dec 28*		
Actual cash price	7.41	Buy January futures	7.60	–$0.19
			+0.21	+$0.01
Sell corn cash at	7.41			
+ gain from futures	0.21			
	7.62			
Storage & interest	–0.18			
	7.44			
Commission	–0.01			
Net cash selling price	$7.43			

8. Suppose in the previous example the expected basis of \$0.20/bu. under never materialized and on December 28 cash prices were \$7.05/bu. and futures were at \$7.60/bu. Would the producer have met his or her market price objective and covered storage costs?
No. A net cash selling price of \$7.07 is \$0.08 under the \$7.15 price objective.

Cash		Futures		Basis
Aug 15		*Aug 15*		
Expected cash price	\$7.61	Sell January futures	\$7.81	–\$0.20
Dec 28		*Dec 28*		
Actual cash price	7.05	Buy January futures	7.60	–\$0.55
			+0.21	–\$0.35
Sell corn cash at	7.05			
+ gain from futures	0.21			
	7.26			
Storage & interest	–0.18			
	7.08			
Commission	–0.01			
Net cash selling price	**\$7.07**			

9. Assume the producer decides not to sell cash soybeans on December 28 and wants to protect the selling price. What action can be taken? **Roll over the hedge to a future month.**

10. Use the previous historical basis table and storage charges of \$0.09/bu. per month and the following futures prices. Calculate the spread, cost for farm storage and net return to storage.

Month	Futures price	Spread	Cost farm storage	Net return to storage
Jan	7.60			
Mar	7.72	**0.12**	**–0.18**	**–0.06**
May	7.86	**0.26**	**–0.36**	**–0.10**
July	8.20	**0.60**	**–0.54**	**+0.06**
Aug	8.22	**0.62**	**–0.63**	**–0.01**

Into which month should the producer roll the hedge? **July**

11. Let's assume on December 28 the producer rolled the hedge from the January option into the July at $8.20/bu. It is now June 28 and the basis has improved from its December low of $0.55 under to its current level of $0.20 under. If July futures are trading at $8.38/bu., what is the outcome of the hedge after rolling into the July option?
A net price of $7.47, or $0.32 over the $7.15 price objective.

Cash		Futures		Basis
Aug 15		*Aug 15*		(Expected)
Expected cash price	$7.61	Sell January futures	$7.81	–$0.20
Dec 28		*Dec 28*		(Actual)
Actual cash price	7.05	Buy January futures	7.60	–0.55
			+0.21	
Dec 28		*Dec 28*		(Expected)
Expected cash price	7.05	Sell July futures	8.20	–0.22
June 28		*June 28*		(Actual)
Actual cash price	8.18	Buy July futures	8.38	–0.20
			–0.18	
Sell corn @	8.18			
+ gain on futures	+0.03			
	8.21	Net	+0.03	
– Storage + interest	0.72			
	7.49			
– Commission	0.02			
	$7.47			

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