

Using Basis Information in a Hog Marketing Program

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Using Basis Information in a Hog Marketing Program

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Basis is the difference between a local cash price and a futures price. An understanding of the hog basis can help producers make better decisions in their marketing programs. It is needed to evaluate marketing alternatives such as hedging or forward contracting, and can serve as a guide of when to market hogs. In addition, local basis information is needed to convert futures market prices to expected local cash prices.

This publication examines the factors that affect the basis, examines characteristics of the Indiana hog basis from 1980 to 1987, and shows how basis information can be used in a hog marketing program.

Factors That Affect Basis

Hog basis is defined and measured as a difference between two prices. One of these, the local cash price, is determined each trading day by the current supply and demand for live hogs. The other price is a futures price. The futures price is often viewed as the price for cash hogs that is expected to prevail in some future time period at the par delivery point, which is Peoria, Illinois. Other terminal markets such as

Omaha, East St. Louis, Sioux City, St. Paul, and Kansas City are also futures delivery markets but at a discount to Peoria. While Indianapolis is not a futures delivery market, prices are reasonably close to Peoria and other terminal markets. Futures prices are determined largely by the expected conditions of supply and demand anticipated for the delivery period.

Differences in the future price and the local cash price can be a result of several factors including:

1. Transportation costs from the local market to a futures delivery point.
2. Differences in grade or quality between the two markets.
3. Delivery costs such as commissions or futures delivery charges.
4. Local supply or demand conditions.
5. Expected future supply or demand conditions at the delivery points.
6. Variation in delivery dates between the two markets.

Futures trading in live hogs occurs in seven contract delivery months: February, April, June, July, August, October, and December. Delivery against the futures contract begins with the first business day of the delivery month. During the delivery period, live hogs can be delivered to satisfy a short (sold) futures position. Therefore during the delivery period, cash prices of hogs at Peoria and the nearby futures contract price will be drawn close to each other. This process of cash and future prices being drawn together during the delivery period at Peoria is called convergence. Convergence of cash and futures price is an important marketing principle and simply suggests that basis at Peoria (and other terminal markets) will be drawn toward zero during the delivery month.

Months in which there is no futures delivery contract are called nondelivery months. During these months, the relationship of futures and cash prices (basis) is not as clear. For example, what should the hog basis be in May? Since there is no May futures contract, the May basis is calculated using May cash prices in relation to June futures. Since early May cash hogs may not be storable until June, the early May cash price and the June futures may be nearly independent markets. For these reasons the basis during nondelivery months is less predictable and more variable than during delivery months.

Historical Basis Data

The basis data used in this publication are calculated as the Indianapolis cash price for barrows and gilts minus the nearby live hog futures price (Weekly basis levels were calculated as follows: weekly cash price, for the last week of December through the 3rd week of February were compared to use weekly February live hog futures contract prices. Cash prices in the final week of February through the third week of April were compared to the April live hog futures contract price, etc.)

The average monthly Indianapolis live hog basis levels are shown in Table 1. A negative basis indicates that the cash prices averaged less than the futures prices for the month. Alternatively, a positive basis means that average cash prices were higher than average futures prices for the month.

Table 1. Average monthly Indianapolis hog basis, 1980-1987.*

Month	1980	1981	1982	1983	1981	1985	1986	1987	1980-87 avg.	Std. dev.
Dollars per hundredweight										
January	-2.42	-3.73	-1.15	-1.09	-1.01	-2.03	1.49	.57	-1.17	1.54
February	-.49	-.93	.07	.29	-.24	-.50	.50	.30	-.13	.46
March	.50	.37	.44	1.46	-.60	-.21	3.15	3.09	1.03	1.33
April	.08	-1.46	-.49	-.60	-.54	-1.26	-.02	.95	-.42	.72
May	-3.21	-6.86	-3.36	-1.74	-5.85	-3.80	-1.02	.45	-3.17	2.26
June	-.40	-.20	-.99	-.76	-2.33	-1.73	.02	.43	-.74	.86
July	1.14	-.46	1.01	.60	.41	.11	1.30	3.63	.97	1.14
August	1.03	1.24	.31	.35	1.22	1.18	2.50	4.64	1.56	1.32
September	3.59	.24	3.26	5.21	2.95	4.80	4.46	8.47	4.12	2.18
October	2.56	.27	1.25	1.80	.99	1.07	1.42	4.05	1.68	1.09
November	-2.69	-3.15	-.74	A.92	-1.91	-1.58	1.15	.27	-1.70	1.81
December	-1.57	.55	-1.21	-1.28	-1.52	-1.63	-1.32	-1.56	-1.19	.67
Yearly avg.	-.16	-1.18	-.13	-.06	-.70	-.47	1.14	2.11	.07	.99

*Basis is the current Indianapolis barrow and gilt price minus the nearby live hog futures price. A positive number indicates that cash prices were above the futures price, a negative number indicates that cash prices were below futures prices. To convert the Indianapolis basis to an Indiana country buying station basis subtract \$1.15. Monthly averages represent the summation of average weekly basis for the last week of the preceding month and the first 3 weeks of the current month.

This table illustrates that wide variation does occur in average basis levels. For example, the January basis has varied from -\$3.73 per hundredweight in 1981 to +\$1.49 in 1986. Also shown in the table are the average basis levels over the 1980 to 1987 period in the next to the last column, as well as the standard deviations in the last column. The standard deviation is a measure of how much variation exists around the average for the 1980 to 1987 period. As an example, in January the average Indianapolis basis was -\$1.17 for the 1980 to 1987 period, but in individual years it was greater or less than this average. By subtracting and adding the January standard deviation of \$ 1.54 per cwt. from the -\$1.17 average, a range of -\$2.71 to \$.37 can be established. Statistically it can be said that this range has contained the actual basis in about two-thirds of the years examined. The larger the standard deviation, the greater the variability in historical basis levels.

Several observations can be made from Table 1 and other related information:

1. Hog basis levels are considerably different at different times of the year and exhibit considerable seasonality.
2. Cash hog prices tend to be higher than the futures prices from July through October, and also in March.
3. Basis levels tend to vary considerably from year to year.
4. Basis levels are most variable (uncertain) in the nondelivery months and less variable (more certain) in delivery months.
5. Basis variability in the 1980's is less than basis variability in the 1970's (not shown here). Thus, basis is becoming more certain, especially in delivery months.

Basis Seasonality

The seasonality of nearby basis patterns can be seen in Figure 1. The years of 1984 and 1985 are used to illustrate fairly typical years. This Figure also represents Indiana country buying station prices rather than Indianapolis. During delivery months, the country basis tends to be about \$1 under the futures as expected (Indianapolis basis is near zero). Basis levels in nondelivery months are related to seasonal hog price patterns. For example in May, cash hog prices tend to rally seasonally about \$4 per hundredweight. Since no futures delivery contract exists for May, the May basis represents the relationship between May cash prices and June futures. Thus, early May prices are compared to the seasonally higher priced June futures giving rise to a large negative basis value. The opposite basis impact occurs in September when higher cash prices of hogs are compared to the seasonally lower prices of October futures giving a large positive basis. In Table 1 and Figure 2, you will note the strong basis years 1986 and 1987. The average yearly Indianapolis basis in 1987, for example, was 2.11 per hundredweight compared to the 1980-1987 average of \$.07. The strong basis in these years was likely related to tight supplies of cash hogs, with a futures market that expected buildup in hog numbers and lower prices.

Help in Marketing

Knowledge of basis can be helpful in a marketing program: (1) to develop a localized cash price estimate from a futures price; (2) in hedging with futures or options; (3) in estimating basis risk; (4) in comparing the marketing alternatives of hedging with forward cash contracting; (5) as a guideline of when to market hogs; and (6) as a guideline of when to lift a hedge. Each of these will be discussed briefly.

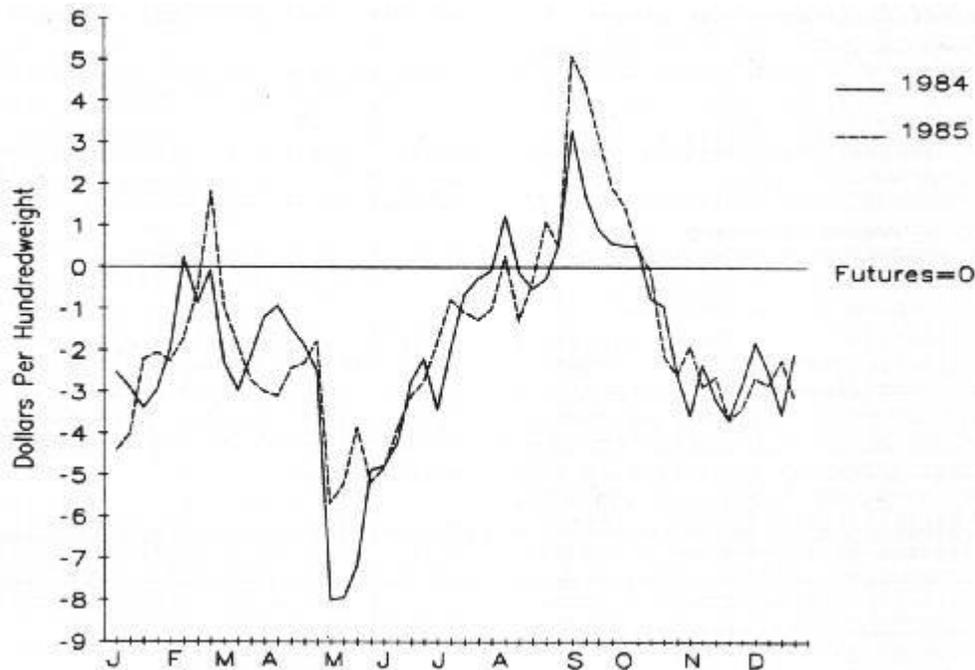


Figure 1. Weekly Indiana country hog basis, 1984 and 1985 (cash hog price minus nearby futures price).

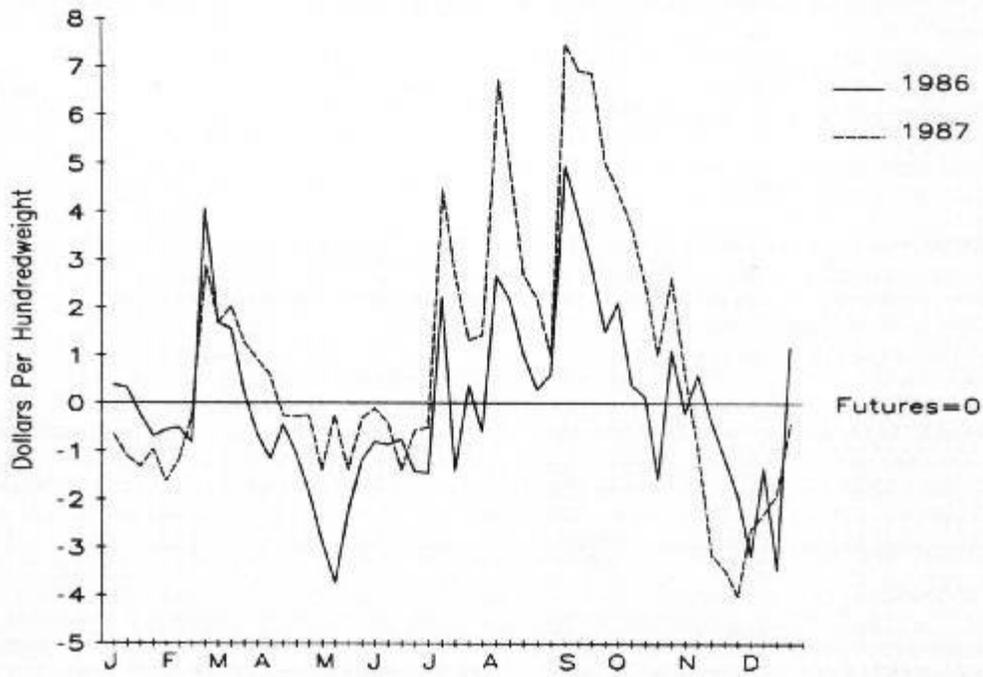


Figure 2. Weekly Indiana country hog basis, 1986 and 1987 (cash hog price minus nearby futures price)

1. Localizing a Futures Price

Basis levels shown in Table 1 are for Indianapolis. However most hogs in the state are sold through Indiana country buying stations rather than at the terminal market. From 1980 to 1987, Indiana country buying station hog prices have averaged \$1.15 per cwt. less than the Indianapolis terminal price. Therefore, to convert the Indianapolis basis levels to country buying stations, subtract \$1.15 from the Indianapolis basis.

If October live hog futures were \$50, what would this imply for expected October cash prices of hogs at a country buying station? The answer:

October futures	\$50.00
Plus basis	+ .53 (\$1.68-\$1.15)
Expected local cash price	\$50.53

The average basis level for 1980-1987 is used in this example. The \$1.68 Indianapolis October basis is reduced by \$ 1.15 to reflect a buying station basis of \$.53. Then the estimated buying station basis is added to futures to provide the expected October cash price. Basis levels for Indiana country buying station locations are shown in Table 3 under the 1980-87 average basis column.

Hog producers can localize an estimate of their local cash hog price for about 14 months into the future by using current futures prices and this basis information.

2. Hedging With Futures or Options

After localizing the futures price a producer will want to evaluate the implications of this price and evaluate pricing alternatives. While the futures price can be viewed as a price predictor, it is not a

perfectly *accurate* price predictor. Therefore it is important to recognize that ultimately prices will likely be different than what the futures had predicted.

Table 2. Indianapolis hog basis variability by month, 1980-1987.

Month	1980-87 avg. basis	Standard deviation	2/3 odds ¹ basis range	95% odds ² basis range
----- Dollars per hundredweight				
Jan	-1.17	1.54	-2.71 to .37	-4.25 to 1.91
Feb	- .13	.46	-.59 to .33	-1.05 to 1.51
March	1.03	1.33	-.30 to 2.36	-1.63 to 3.69
April	- .42	.72	-1.14 to .30	-1.86 to 1.01
May	-3.17	2.26	-5.43 to -.91	-7.69 to 1.35
June	- .74	.86	-1.60 to .12	-2.46 to .98
July	.97	1.14	-.17 to 2.11	-1.31 to 3.25
Aug	1.56	1.32	.24 to 2.88	-1.08 to 4.20
Sep	4.12	2.18	1.94 to 6.30	-.24 to 8.48
Oct	1.68	1.09	.59 to 2.77	-.50 to 3.86
Nov	-1.70	1.82	-3.52 to .12	-5.34 to 1.94
Dec	-1.19	.67	-1.86 to -.52	-2.53 to .15

1 Range represents +/- one standard deviation around the average basis.

2 Range represents +/- two standard deviations around the average basis.

By selling futures, the producer can establish the futures price for a group of hogs. The use of options markets will enable the producer to establish a minimum futures price while not limiting prices if futures prices should later increase.

Hedging with futures or options does not, however, establish basis. Therefore, the hedging producer is still subject to basis uncertainty (as shown by standard deviations in Table 1). For example, a hedger pricing May hogs who sold June futures at \$52 expecting a May basis of -\$4 (net final price of about \$48) would find it unpleasant if the actual May basis turned out to be -\$7 (net final price of \$45).

3. Estimating Basis Risk

Use of the standard deviations in Table 1 will help producers evaluate the level of basis risk they face if hedging with futures or options. Remember the statistical rule that +/- one standard deviation represents about two-thirds of the historical observations. Therefore, a hedger expecting a May Indianapolis basis at the 1980-87 average of -\$3.17 should consider that with a \$2.26 standard deviation, the historical May basis has been within a range of -\$5.43 to -\$.91 about two-thirds of the time. This represents +/- one standard deviation from the mean. Using a basis range, which represents +/- two standard deviations, will include about 95 percent of the historical observations.

Monthly basis ranges representing both two-thirds and 95 percent odds are given for Indianapolis in Table 2. These same ranges for Indiana country buying points are calculated in Table 3. These Tables will provide quick references for basis levels to localize a futures price and help evaluate basis risk.

Table 3. Indiana country buying station hog basis variability by month, 1980-1987.

1980-87	Standard	2/3 odds ¹	95% odds ²
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Month	avg. basis	deviation	basis range	basis range
----- Dollars per hundredweight				
Jan	-2.32	1.54	-3.86 to -.78	-5.40 to .76
Feb	-1.28	.46	-1.74 to -.82	-2.20 to -.36
March	-.12	1.33	-1.45 to 1.21	-2.78 to 2.54
April	-1.57	.72	-2.29 to -.85	-3.01 to -.11
May	4.32	2.26	-6.58 to -2.06	-8.84 to .20
June	-1.89	.86	-2.75 to -1.03	-3.61 to -.17
July	-.18	1.14	-1.32 to .96	-2.46 to 2.10
Aug	.41	1.32	-.91 to 1.73	-2.23 to 3.01
Sep	2.97	2.18	.79 to 5.15	-1.39 to 7.33
Oct	.53	1.09	-.56 to 1.62	-1.65 to 2.71
Nov	-2.85	1.82	-4.67 to -1.03	-6.49 to .79
Dec	-2.34	.67	-3.01 to -1.67	-3.68 to -1.00

1 Range represents +/- one standard deviation around the average basis.

2 Range represents +/- two standard deviations around the average basis.

Hedgers do face sizable basis uncertainty especially in nondelivery months. For example, consider the hedger who will deliver September hogs to a local buying station. If October futures were hedged at \$50, the expected price would be \$52.97 (\$50 + 2.97) before futures transaction costs. However, since final basis is not known until the hedge is lifted and the cash hogs are priced, the final net price is subject to basis being different than expected. For this example of September hogs, there is a 65 percent historical chance that basis uncertainty would cause the final net price to be \$ 1.00 or more different than expected (less than \$51.97 or greater than \$53.97). These probabilities for basis uncertainty are shown in Table 4a.

As another example, February basis has varied by \$.50 or more per cwt. 28 percent of the time. However, the September basis has varied by \$.50 or more per cwt. 82 percent of the time. Information in Table 4 again demonstrates the higher degree of basis uncertainty faced by hedgers in nondelivery months, where in May, for example, the basis has varied by \$2.00 or more per cwt. from expected levels 37 percent of the time.

Table 4. Historical odds that a final expected price would vary by the stated dollars per hundredweight or more because of basis variability, 1980-1987.

Month	Final expected price variation by at least this amount:			
	\$.50	\$1.00	\$1.50	\$2.00
----- Percent probability				
January	74	52	33	19
February	28	3	x	x
March	70	45	26	13
April	49	16	4	x
May	83	66	51	37
June	56	25	8	2
July	66	38	19	8
August	70	45	25	13
September	82	65	49	36
October	65	36	17	7
November	79	58	41	27
December	45	14	3	x

x= Historical odds less than 1 percent.

4. Comparing Hedging and Forward Cash Contracting

Using the previous example of the producer who had localized an expected cash price from hedging of \$52.97 on September delivery hogs, how would this compare with a bid of \$52.50 on a forward cash contract from his country buying station? If he hedges, some hedging costs for commissions and interest on margin money will be involved, say \$.35 per cwt. Thus, the expected local price net of hedging cost would be reduced to \$52.62. The expected final net price from hedging is higher than the forward contract price. However, the hedger must accept the basis uncertainty and will want to consider potential basis ranges and observe the historic probabilities of basis uncertainty considered in Tables 2, 3, and 4. In forward cash contracting, the buying agency accepts all the basis uncertainty and hedging costs.

The ultimate decision of which alternative to use will also depend upon additional factors such as risk preferences of the producer, his level of knowledge of futures markets, and the terms of the forward cash contract.

Some hog buyers have tried to keep their basis quote constant throughout the year when cash contracting. For example, a country buying station manager might bid a flat \$2.00 under the respective futures month regardless of the month. It is clear when looking at country station basis in Table 3 that this will result in bids that may be well over or under what is actually expected for that time period. In May, for example, a \$50 June futures price would result in a bid of \$48. However, a more realistic view of basis would suggest a -\$4 basis and an expected price of \$46. A producer in this case would likely use the forward cash bid of \$48 and forget hedging. For September delivery hogs, on the other hand, \$2 under \$50 October hog futures would result in a forward bid of \$48. A more realistic basis is +\$3.00, which would result in a localized expected hedging price of about \$53.00 before hedge costs. In this case the producer would be advised to hedge.

As buyers become more aware of basis, expect them to: (1) vary their basis level throughout the year; (2) expect a wider basis than average to reflect potential hedging costs and basis uncertainty; (3) be cautious about forward contracting hogs in May, September, and November because of large basis risk.

5. Guideline of When to Market

Basis can serve as a guideline of when to be more aggressive in selling hogs. The normally large negative basis in May results from a higher June futures price than May prices. From this signal it can be interpreted that the consensus in the futures marketplace is that cash prices will rise to meet futures by June. Should this occur, holding to heavier weights might be profitable.

However, sometimes the consensus that May cash prices will move higher is incorrect and convergence of cash and futures prices occurs by futures prices moving lower to meet the cash price. If this occurs, holding hogs to heavy weights may not be profitable.

In either case, however, a large negative basis in early May will narrow by early June in the convergence process. The amount of the narrowing basis can be earned by the producer who holds the hogs on feed and sells June futures in early May. Regardless of how convergence occurs, this strategy will earn the change in basis, which has been as much as \$6 to \$8 per cwt. in some years.

In any delivery month, cash prices (at Peoria) may be above or below futures. If they are above futures, it is likely a signal that the futures market consensus expects lower prices in coming days. If cash prices at the par delivery point are below futures, there is a futures consensus that cash prices will be rising in

coming days.

Finally, in late summer, the basis is often a large positive number as late summer cash prices are compared to seasonally lower prices of October futures. This could be viewed as a guideline to market hogs at lighter weights rather than carry them into the expected lower priced time periods of late September and October. The more positive the basis, the stronger the signal to sell early.

When to Lift a Hedge

Generally a hedge is placed in either the futures or options market with some expectation of basis levels at the time the hedge is to be lifted. Knowledge of basis and a watchful eye on basis is particularly important when a hedge is to be lifted.

Daily basis levels are often erratic. For example, on a nice early October day when many hog producers are harvesting grain, cash hogs may be \$1.00 higher because of short market runs. However, futures prices may be little changed. The hedged hog producer who expected a 0 basis might find the basis at +\$1.00 this day. The producer who had sold futures at \$48 expecting a \$48 localized price could convert the hedge to a cash sale on this day and generate a \$49 price ($\$48 + \$1 = \49) because of the better basis relationship.

Most hog buyers who write forward cash hog contracts reserve the right to specify the exact day delivery will be made (within about a two to three week period). Apparently the right to specify the day enables them to request delivery and lift their hedge when the basis is most favorable to them.

Summary

An understanding of basis will prove useful in almost any hog marketing program regardless of whether basis information is simply used to localize a futures price or to evaluate the basis risk in a hedging program. While historical basis levels are provided in this publication, producers will want to maintain their own current basis data to help them evaluate current market conditions.

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