Using Historical Basis Information for Hedging Indiana Hogs

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Low hog prices in the winter of 1998 encouraged more Indiana producers to take another look at hedging hogs. One of the critical elements in the decision to hedge is the basis. The basis used in this study is the price relationship between the Indiana-Ohio direct hog price and the nearby futures price. Two important uses of the basis are for localizing the expected net returns from a futures hedge, and to examine the possible variation in price that may arise due to basis uncertainty.

Basis Calculations

The data shown in this article were calculated from the weekly average prices of Indiana-Ohio direct hogs as reported by USDA Market News Service. Prices are for USDA #1 and #2 grades weighing 230 to 250 pounds. These weekly cash prices are shown in Table 1 for the years 1992 to 1997. In addition, the average price over the six years is shown on the right hand side of the table.

The weekly pattern of cash prices throughout the year has a distinct pattern, as shown in Figure 1. The lowest prices of the year have tended to come from mid-October to mid-January. These prices have averaged about $42 per live hundredweight. Prices then tend to rally into mid-February highs, followed by a lull in prices through April. From early May to June the trend is sharply higher. The summer months of June, July, and August have averaged about $50 per live hundredweight over the 1992 to 1997 period.

Weekly average futures prices are calculated by taking the average of all the daily settlement prices for the week. In all cases, the futures price is the nearby futures delivery month. For example, in January, the weekly cash hog prices are compared to the February futures. In February, cash prices for the first three weeks of February are compared to the February futures. However, since the February futures matures about February 20, cash prices for the last week of February are compared to the April futures. This process continues throughout the year.

The futures contract is now a lean hog contract, which requires some adjustment to liveweight. Starting with the February 1997 contract, conversion was made to a lean hog contract using the standard yield of .74. For example, a lean hog futures at $60 * .74 equals $44.40 per live hundredweight. The lean contract is based upon a 51% to 52% lean carcass. This may be somewhat higher than the average hog being marketed today. This means that the .74 conversion may give a futures price which is somewhat higher than the old liveweight contract. After a few years of trading the new lean contract, better evaluations of basis can be made for this new contract.

Using Basis Data

The historical basis data provided here can be used in two important ways. The first is to "localize" the futures price. Say the February lean futures are trading at $60 – what would this mean to a hog producer who wanted to sell the futures as a hedge for hogs going to market in the first week of January? First convert the $60 lean price to a live price by multiplying by .74; $60 * .74 = $44.40 per live hundredweight. Next, in Table 2, look up the basis for the first week of January; this has averaged -$4.17. Add the basis to the converted futures to localize the expected hedge price; $44.40 + (-$4.17) = $40.23 per live hundredweight. Of course, any commissions and interest on margin money would have to be deducted to estimate a net hedge return.

You can see from Figure 2 that there is a substantial amount of seasonality to the basis. This means the weekly basis can be quite different depending upon the time of year. This is related to the strong seasonality of cash prices and the maturity of the various futures contracts. Take the last week of April as an example. The April futures matures in the third week of April; thus basis is calculated as the cash prices in the fourth week of April in relation to the June futures. Generally by June there is a sharp seasonal increase in hog prices, so the June futures tend to trade at a substantial premium to the late April cash price. This results in the late April average basis of -$7.59 per live hundredweight as shown in Table 2 and Figure 2. On the other hand, cash prices in the last week of August are compared to the October futures contract. Generally hog prices move sharply lower by October; thus the basis for the fifth week of August is the highest of the year, and averaged +$2.31 per live hundredweight over the 1992 to 1997 period.

Basis Uncertainty

A second helpful component of the basis data is the degree to which basis varies from year to year. For example, from Table 2 in the first week of January, the basis has varied from a low of -$5.25 in 1997 to a high of -$2.81 in 1995. Basis varies from year to year depending upon the particular situation for cash and futures markets. A statistical measure called the standard deviation is shown in Table 2 and provides some assistance in considering how variable the basis might be.

For the first week of January, the standard deviation of the basis was $.92 per live hundredweight. How could a producer use the standard deviation to help them localize a hedge price for the first week of January? Again, assume a $60 February futures *.74 equals $44.40 liveweight. The expected hedge price is $44.40 +(-.4.17) = $40.23 per live hundredweight. Now to this expected hedge price add $.92 and subtract $.92 (the standard deviation for that week). This gives a range of $39.31 to $41.15. Statistically, this range has included the basis about 2/3 of the time in the historic data period 1992 to 1997. Adding and subtracting two standard deviations from the mean gives a range of $38.39 to $42.07, which has included the historical basis in about 95% of the historical observations.

The smaller the standard deviation, the more closely the basis has tended to be around the average basis level. When the basis standard deviation is under $1, this is generally a relatively low basis variability. On the other hand, there are times like late July and August when the basis standard deviation is over $2.

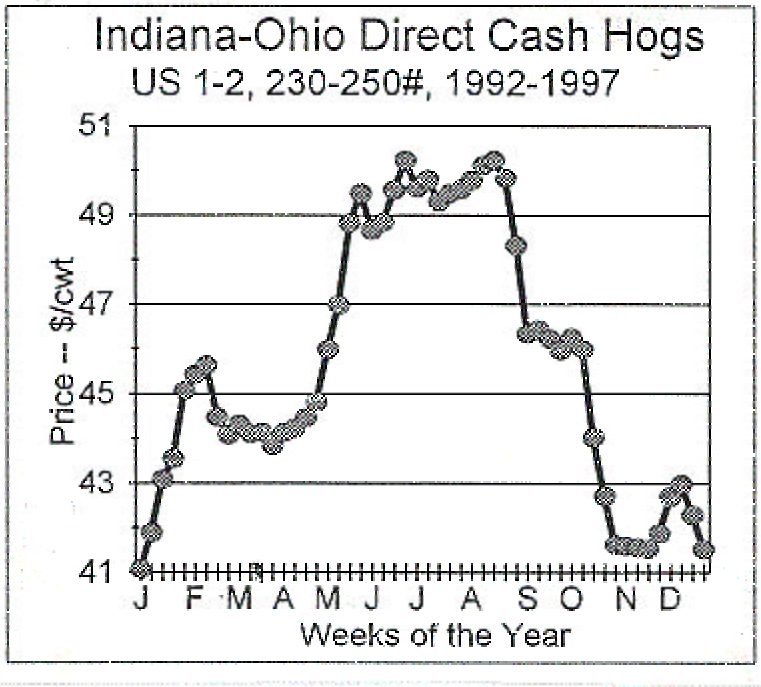

Figure 1.

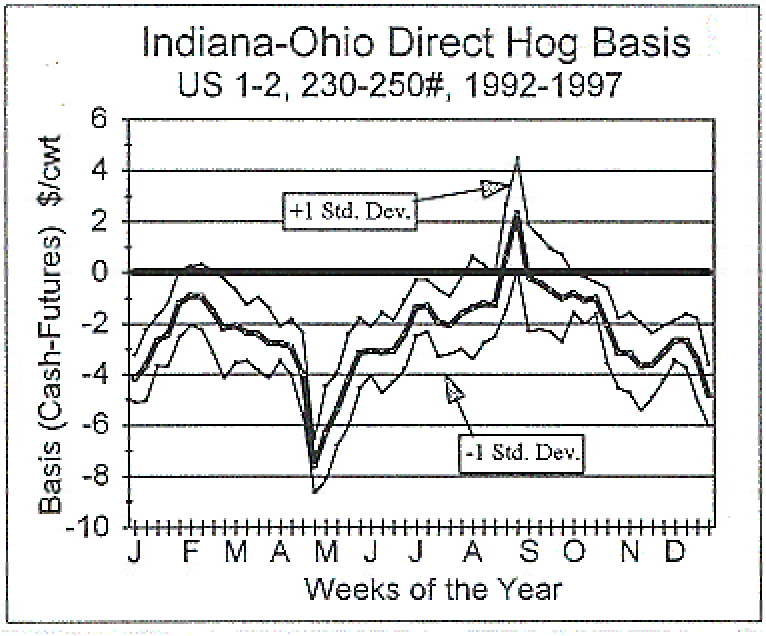

Figure 2.

Table 1. Indiana-Ohio cash market prices, for #1 and #2 grade barrows and gilts weighing 230 to 250 lb.

	Weekly Averages						6 Year	Standard
Week	1992	1993	1994	1995	1996	1997	Averages	Deviation
J1	35.48	39.25	40.87	35.38	42.19	53.19	41.06	6.56
2	36.75	41.43	42.75	36.68	41.88	51.85	41.89	5.54
3	37.10	42.45	45.50	38.03	42.30	53.08	43.08	5.80
4	38.40	42.60	45.60	39.78	42.88	51.95	43.54	4.83
5	38.73	43.65	48.08	39.38	46.68	53.83	45.06	5.71
F1	40.65	43.90	48.75	40.00	45.93	53.33	45.43	5.07
2	41.25	45.18	47.38	40.40	47.40	52.18	45.63	4.38
3	39.28	44.74	47.08	38.80	47.35	49.58	44.47	4.48
4	38.10	45.45	45.50	37.90	47.68	49.80	44.07	4.97
M1	38.75	45.70	45.60	38.43	48.55	48.82	44.31	4.63
2	38.68	47.05	44.05	38.65	48.58	47.60	44.10	4.47
3	38.75	48.45	43.10	37.95	49.10	47.48	44.14	4.96
4	38.70	46.50	42.03	36.70	49.03	50.02	43.83	5.53
A1	40.70	45.48	42.43	35.93	49.13	51.09	44.13	5.61
2	41.00	45.50	41.65	35.40	49.65	52.15	44.23	6.14
3	40.75	44.43	42.33	35.20	49.53	54.50	44.46	6.79
4	40.55	45.38	42.13	34.73	49.80	56.30	44.82	7.54
M1	44.63	45.35	41.63	35.38	51.50	57.38	45.98	7.67
2	44.45	46.78	42.45	36.20	55.03	56.90	46.97	7.83
3	44.30	48.93	43.30	37.98	58.85	59.52	48.81	8.76
4	44.59	49.48	42.83	39.35	62.35	58.25	49.48	9.09
J1	45.23	48.91	42.55	39.53	59.50	56.22	48.66	7.84
2	46.90	49.15	42.13	40.65	57.33	56.78	48.82	7.09
3	47.83	48.75	43.63	42.70	56.68	57.73	49.55	6.38
4	48.60	49.20	43.90	46.28	55.33	58.00	50.22	5.40
J1	47.03	47.18	43.28	46.03	54.40	59.65	49.60	6.15
2	46.20	47.63	42.19	46.06	56.38	60.28	49.79	6.97
3	43.50	46.15	42.35	47.40	57.40	58.93	49.29	7.12
4	43.93	45.03	42.12	46.98	59.08	59.78	49.49	7.86
5	43.03	45.18	42.73	47.13	60.08	59.23	49.56	7.98
A1	43.75	47.10	42.43	47.70	60.60	57.05	49.77	7.37
2	44.38	47.78	42.68	47.98	60.78	57.00	50.10	7.20
3	45.08	48.38	42.53	49.45	59.83	56.08	50.23	6.58
4	44.08	48.78	41.98	51.30	57.85	54.93	49.82	6.14
5	42.13	48.65	39.05	50.50	56.85	52.65	48.31	6.64
S1	42.25	48.94	35.72	48.19	52.66	50.25	46.34	6.24
2	41.10	49.20	35.73	48.80	53.38	50.35	46.43	6.63
3	41.15	48.30	34.33	48.68	53.75	51.15	46.23	7.19
4	42.38	47.03	33.50	47.68	55.70	49.55	45.97	7.48
O1	42.30	48.90	33.08	46.50	57.25	49.45	46.25	8.09
2	42.35	47.98	33.40	46.20	56.90	49.05	45.98	7.80
3	41.60	45.70	30.45	45.65	54.60	46.10	44.02	7.90
4	41.35	45.08	30.32	42.63	51.08	45.75	42.70	6.93
5	39.90	44.25	29.53	39.80	50.78	45.38	41.61	7.17
N1	40.98	43.08	28.48	39.72	52.03	45.20	41.58	7.75
2	42.30	41.53	27.90	39.88	52.80	44.89	41.55	8.09
3	41.38	40.94	27.34	40.09	53.98	45.43	41.53	8.65
4	41.53	40.90	27.78	41.35	54.88	44.75	41.87	8.69
D1	42.85	40.85	29.38	43.15	55.88	44.00	42.69	8.44
2	42.20	40.28	32.70	45.30	54.13	43.25	42.98	6.98
3	40.58	40.03	34.40	45.20	54.08	39.40	42.28	6.72
4	39.81	40.63	33.81	44.75	53.16	36.92	41.51	6.79
Yearly Avgs.	41.91	45.56	39.55	42.14	52.97	51.81	45.66	

Table 2. Indiana-Ohio basis (cash-futures), for #1 and #2 grade barrows and gilts weighing 230 to 250 lb.

	Weekly Averages						6 Year	Std.	6 Yr Avg	6 Yr Avg
Week	1992	1993	1994	1995	1996	1997	Avgs.	Dev.	+1 SD	-1 SD
J1	-4.38	-3.68	-5.07	-2.81	-3.83	-5.25	-4.17	0.92	-3.25	-5.09
2	-3.24	-2.72	-4.32	-1.90	-3.73	-5.95	-3.64	1.40	-2.24	-5.04
3	-3.49	-1.33	-2.29	-1.97	-3.14	-3.82	-2.67	0.97	-1.71	-3.64
4	-2.63	-1.29	-2.78	-0.78	-2.95	-4.23	-2.44	1.24	-1.20	-3.68
5	-2.87	0.13	-1.96	-0.08	-0.19	-2.30	-1.21	1.32	0.10	-2.53
F1	-1.11	-0.45	-0.21	0.69	-1.90	-2.46	-0.91	1.16	0.25	-2.06
2	-0.44	-0.40	-1.41	0.99	-1.85	-2.58	-0.95	1.26	0.32	-2.21
3	-0.20	-0.44	-2.74	-0.36	-1.16	-4.21	-1.52	1.62	0.10	-3.14
4	-2.12	-0.65	-3.19	-1.60	-0.14	-5.49	-2.20	1.94	-0.26	-4.14
M1	-2.03	-2.60	-2.45	-1.19	0.02	-4.28	-2.09	1.45	-0.64	-3.53
2	-2.01	-2.77	-2.70	-2.24	-0.51	-3.88	-2.35	1.11	-1.24	-3.46
3	-1.73	-1.94	-3.96	-1.49	-0.82	-4.37	-2.39	1.43	-0.95	-3.82
4	-2.07	-2.89	-4.58	-0.99	-1.87	-4.13	-2.76	1.39	-1.37	-4.14
A1	-2.23	-1.97	-3.95	-2.65	-2.91	-2.93	-2.77	0.69	-2.08	-3.47
2	-2.38	-1.58	-3.98	-2.90	-4.45	-2.23	-2.92	1.10	-1.83	-4.02
3	-3.63	-1.96	-4.11	-2.66	-5.12	-6.43	-3.99	1.63	-2.36	-5.62
4	-7.52	-6.44	-9.18	-8.38	-7.45	-6.60	-7.59	1.05	-6.55	-8.64
M1	-3.53	-6.93	-8.06	-6.34	-8.11	-4.79	-6.29	1.83	-4.46	-8.12
2	-3.41	-4.44	-7.00	-4.85	-6.93	-5.59	-5.37	1.42	-3.95	-6.79
3	-2.69	-3.37	-6.33	-4.91	-5.97	-1.92	-4.20	1.81	-2.39	-6.01
4	-2.69	-2.86	-5.09	-4.59	-1.86	-1.85	-3.16	1.38	-1.78	-4.53
J1	-2.06	-2.29	-4.42	-3.97	-2.44	-3.20	-3.06	0.97	-2.10	-4.03
2	-0.76	-2.15	-4.27	-3.23	-5.26	-3.16	-3.14	1.58	-1.56	-4.72
3	-1.65	-2.69	-4.88	-3.04	-4.03	-2.09	-3.06	1.21	-1.85	-4.27
4	0.03	-1.89	-3.75	-3.05	-3.34	-2.52	-2.42	1.36	-1.06	-3.78
J1	0.12	-1.07	-3.29	-1.20	-1.34	-1.46	-1.38	1.10	-0.28	-2.47
2	-0.25	-0.93	-3.01	-0.44	-1.36	-1.80	-1.30	1.01	-0.28	-2.31
3	-1.97	-1.28	-4.22	-0.40	-1.36	-2.55	-1.96	1.32	-0.65	-3.28
4	-1.80	-2.32	-4.15	-1.26	-1.84	-0.92	-2.05	1.14	-0.91	-3.19
5	0.28	-3.06	-3.40	-1.35	-1.36	-0.74	-1.60	1.40	-0.21	-3.00
A1	0.27	-2.40	-3.50	-0.30	1.19	-3.46	-1.37	2.02	0.65	-3.39
2	0.56	-1.03	-3.16	0.19	-0.89	-2.96	-1.21	1.55	0.34	-2.77
3	0.22	-2.24	-2.75	0.29	-1.47	-1.59	-1.26	1.26	0.00	-2.51
4	2.75	0.45	-0.76	0.86	-2.48	2.88	0.62	2.06	2.68	-1.44
5	1.65	1.44	0.31	6.08	3.61	0.77	2.31	2.17	4.48	0.14
S1	1.20	0.51	-3.07	2.58	-0.41	-2.08	-0.21	2.10	1.88	-2.31
2	0.55	-0.30	-2.45	2.69	-1.36	-1.46	-0.39	1.83	1.44	-2.22
3	0.20	-0.29	-2.72	1.88	-1.87	-1.35	-0.69	1.64	0.95	-2.33
4	0.00	-0.57	-3.40	1.50	-1.50	-2.06	-1.01	1.71	0.71	-2.72
O1	-0.59	-0.63	-1.76	0.46	-1.25	-1.12	-0.82	0.76	-0.05	-1.58
2	-0.88	-1.42	-0.25	0.07	-2.39	-1.60	-1.08	0.91	-0.17	-1.99
3	-1.04	-1.74	-0.10	-0.47	-1.41	-1.24	-1.00	0.61	-0.39	-1.61
4	-1.63	-3.16	-3.22	-1.91	-3.12	0.62	-2.07	1.49	-0.58	-3.56
5	-3.08	-3.55	-4.68	-3.22	-3.85	-0.61	-3.17	1.37	-1.79	-4.54
N1	-2.07	-3.53	-4.64	-3.48	-4.60	-0.56	-3.15	1.58	-1.57	-4.72
2	-2.28	-4.24	-4.95	-4.27	-5.39	-0.90	-3.67	1.72	-1.95	-5.39
3	-3.25	-4.65	-4.52	-4.02	-4.11	-1.27	-3.64	1.26	-2.38	-4.90
4	-2.80	-4.21	-3.21	-3.24	-4.14	-1.24	-3.14	1.09	-2.05	-4.23
D1	-1.59	-3.26	-2.00	-3.52	-3.23	-2.32	-2.65	0.79	-1.86	-3.44
2	-1.84	-3.22	-1.38	-2.41	-4.36	-2.82	-2.67	1.06	-1.62	-3.73
3	-2.59	-2.89	-1.21	-3.11	-5.64	-4.91	-3.39	1.62	-1.77	-5.01
4	-3.79	-4.49	-5.50	-4.89	-3.50	-6.77	-4.82	1.20	-3.63	-6.02
Yearly Averages	-1.63	-2.19	-3.45	-1.68	-2.68	-2.69	-2.39			