BASIS VARIABILITY ON THE FEEDER CATTLE CONTRACT

VERSUS THE FAILED STOCKER CONTRACT

Sebastian L. Perversi
Dillon M. Feuz
Wendy J. Umberger*

Contact Author
Dillon M. Feuz
University of Nebraska
4502 Ave I
Scottsbluff, NE 69361
dfeuz@unl.edu

Selected Paper presented at the
Western Agricultural Economics Association Annual Meeting
Long Beach, CA, July 28-31, 2002

Abstract

Basis variability is compared across markets, over time, between stocker and feeder cattle and the impact of market volume is determined. Variability was significantly greater with the Stocker contract. Volume varied seasonally by market. Increased market volume significantly reduced basis variability. Increased variability in market volume significantly increased basis variability.

*Authors are graduate student and Associate Professor in the Department of Agricultural Economics at University of Nebraska-Lincoln and Assistant Professor in the Department of Agricultural and Resource Economics at Colorado State University.

Basis Variability on the Feeder Cattle Contract Versus the Failed Stocker Contract

Introduction

Knowledge of basis level and perhaps more importantly, basis variability is essential when evaluating forward pricing alternatives. Most forward contracts are based on basis relationships and being able to estimate basis correctly is critical to determining the outcome of a hedge using futures or options. As basis variability relative to price variability increases, the incentives to hedge are reduced.

The Chicago Mercantile Exchange (CME) first introduced a feeder cattle contract in 1971. It was a deliverable contract for 600-800 pound steers. On September 1, 1986, the contract changed to a cash-settled contract using the U.S. Feeder Steer Price for a settlement. Beginning January 1, 1993 the settlement price was changed to the CME Composite Weighted Average Price for feeder steers. This index had a different regionally and volume-weighted scheme and the weight range was narrowed to 700-800 pounds. In November 1998, the CME introduced a new cash settled stocker contract for 500-600 pound steers. The weight range for feeder cattle was also increased to 700-849 pounds.

Each of these changes was designed to reduce hedging risk by reducing basis variability, and thus, to improve the ability of producers to hedge feeder cattle and stocker cattle. A 1994 study by the CME concluded that basis variability for 700-800 pound steers had been significantly reduced by changing to a cash-settled contract. Umberger, 1998, examined basis variability in three markets for 700-800 pound steers and for 500-600 pound steers. Her results substantiated the results from the CME study in that she found a reduction in basis variability for the 700-800 pound steers following the change to cash settlement. She found no significant change in basis variability for the 500-600 pound steers. However, following the change in the cash settlement index and the narrowing of the weight range in 1993, she found that basis variability significantly increased for the 500-600 pound steers. Feuz and Umberger, 2000, concluded that basis variability for 500-600 pound steers was reduced by using the CME stocker contract rather than the feeder contract but that it was still significantly larger than basis variability for 700-800 pound steers on the feeder cattle contract.

Feeder cattle prices vary across lots, across markets and over time. There have been a number of previous studies that have examined differences in lot prices. They have generally found some combination of cattle characteristics (breed, sex, fill, etc.) and lot characteristics (size, uniformity, sale order) explain much of the variability within a particular market (Bailey, Peterson and Brorsen, 1991 and Sartwelle et.al., 1996). Studies of seasonal price patterns and of historic basis relationships have been done for most regions of the country. Differing production systems altering the regional supply and demand situation and different cattle types can explain much of the price level differences between regions.

However, there still remains variability in prices due to volume, or more likely lack of volume, in a particular weight class or in some cases for an entire market. The volume of stocker cattle being traded is quite seasonal in most markets. Feeder cattle volume may also fluctuate seasonally, but generally will not be as extreme as stocker volume. The overall objective of this paper is to analyze stocker and feeder cattle basis variability as a function of the volume of sotcker or feeder cattle being sold. Specific objectives are: 1) to compare basis variability across markets, over time, and between stocker (550 lb) and Feeder (750 lb) cattle; and 2) to analyze basis variability as a function of market volume and price level.

Data and Procedures

Feeder cattle auction market price and volume data was obtain from January 1993 until September 2001 from the Chicago Mercantile Exchange (CME) for the following markets: Ada, OK; Billings, MT; Clovis, NM; Dodge City, KS; Kearney, NE; La Junta, CO; St. Joseph, MO; Torrington, WY; Vienna, MO; and West Fargo, ND. These auctions contribute to the CME stocker and feeder indexes, occur on Wednesday, and represent a broad range of overall auction volume. Weekly basis was determined for each weight category and market by subtracting the CME stocker index and feeder index from the market price for 500-600 and 700-800 pound steers, respectively.

The mean basis level and the standard deviation of the basis was calculated for each market and weight class. The data also were tested for normality using the SAS Proc Univariate procedure and the data were found to be normally distributed. Differences in mean basis levels were not a focus of this paper, which was concerned with basis variability. Basis variability was compared across markets and within markets between the two weight classes. Our null hypothesis was that basis variability was equal across all markets and weight classes, versus the alternative hypothesis that basis was not equal. The specific hypothesis and test were:

H_o: $\sigma^2_1 = \sigma^2_2$ versus H_a: $\sigma^2_1 \neq \sigma^2_2$ and the test statistic is $F = s^2_1/s^2_1$. The null hypothesis was rejected if the value of F exceeds an $F_{(\alpha/2)(n_1-1,\, n_2-1)}$.

The mean and standard deviation of volume for each market and weight class also were determined. As volume varies considerably throughout the year for some markets and weight classes, the mean and standard deviation of volume were determined on a quarterly basis in addition to the overall mean and standard deviation.

We hypothesized that as volume decreased in a market, variability of basis would increase and that as variability of volume increased in a market, variability of basis also would increase. To test this hypothesis, we calculated a 10 week rolling average for basis and volume in each market and weight class and the corresponding standard deviation for basis and volume. The following equation was then estimated for each market and for each weight class using OLS regression:

$$SDBasis_{ij} = \beta_0 + \beta_1 Cash_{ij} + \beta_2 Volume_{ij} + \beta_3 SDVolume_{ij} + \beta_4 SDWeight + \beta_5 Contract + \varepsilon$$

Where $SDBasis_{ij}$ is the 10 week standard deviation of basis;

Cash is the 10 week rolling average cash price;

Volume is the 10 week rolling average number of head sold;

SDVolume is the 10 week standard deviation of volume;

SDWeight is the 10 week standard deviation of the average weight;

Contract is a 0/1 dummy equal to 1 if the week is in a contract month;

i is the market (Ada, Billings, Clovis, Dodge City, Kearney, La Junta, St. Joseph, Torrington, Vienna, and West Fargo); and

j is the weight class (500-599 and 700-799 pounds).

The cash variable captures the market level and our hypothesis is that as price level increases, basis variability will increase. We hypothesize that an increase in volume will decrease basis variability and an increase in volume variability will increase basis variability. We also hypothesize that as weight variability increases, basis variability will also increase. Lastly, we hypothesize that basis variability will decrease in contract months.

Results

Samples of the data for one year and one specific market are displayed in Figures 1 and 2. It is apparent that volume varies seasonally for both stocker and feeder cattle and that there is

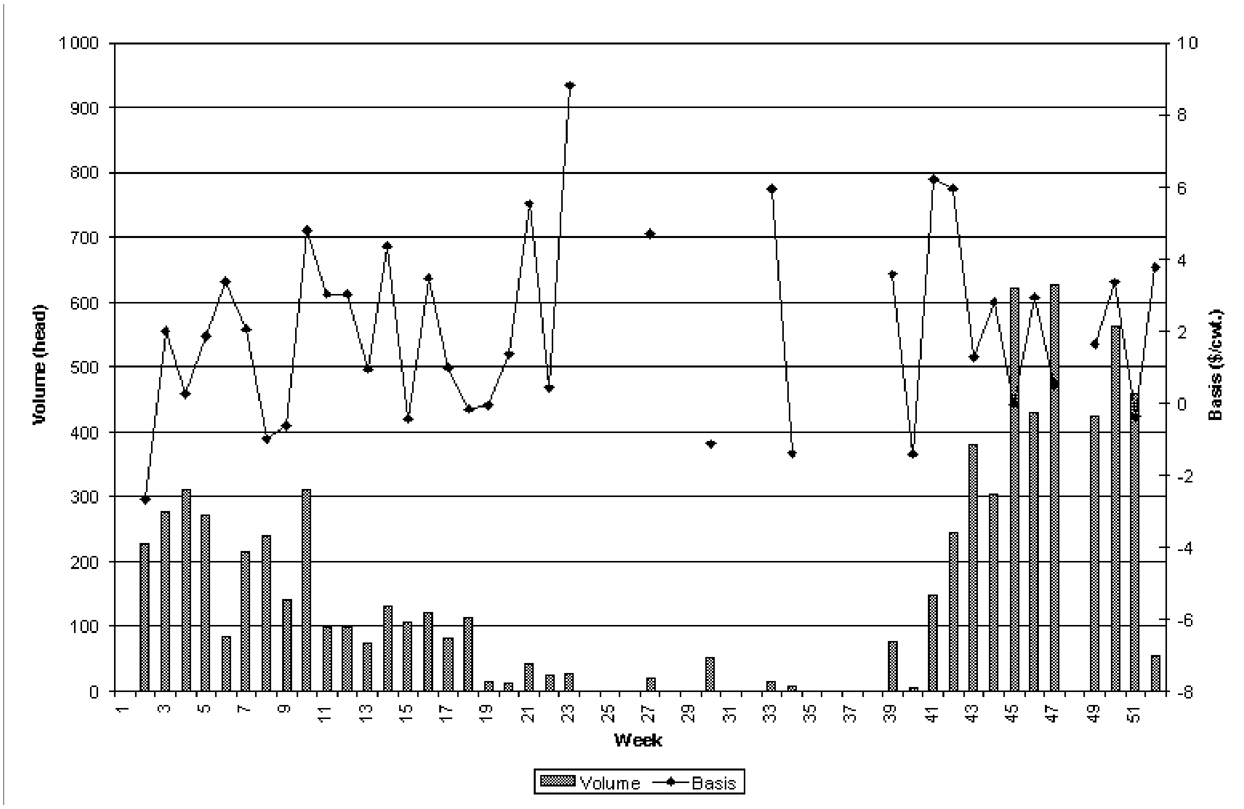

Figure 1. Weekly Stocker Basis and Weekly Volume for one Market and Year.

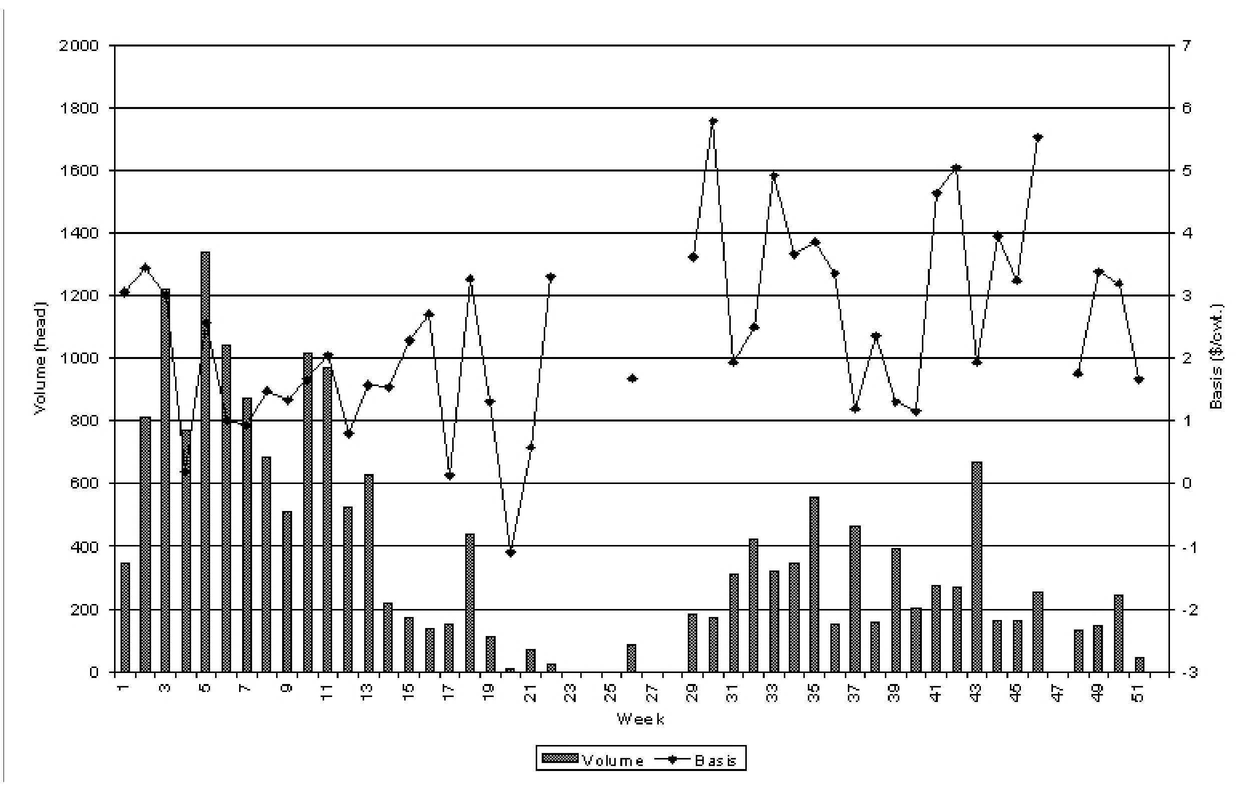

Figure 2. Weekly Feeder Basis and Weekly Volume for one Market and Year.

considerable variability in basis week to week. Plots of each market and year would show similarities and differences. The similarities are that there is variability in volume and basis, and the differences are in the magnitudes of the variability and the seasonal patterns.

Summary statistics on basis and volume for each market for stocker and feeder cattle are presented in Table 1. We had hypothesized that basis variability would not be equal between stocker cattle and feeder cattle in the same market. In all ten markets, stocker basis variability exceeded feeder basis variability at a 96 percent level of significance. There is more risk to producers who hedge stocker cattle than to producers who hedge feeder cattle. Basis variability also differed significantly across markets. Dodge City, Kansas and Kearney, Nebraska had the least amount of basis variability for feeder cattle. Clovis, New Mexico and Vienna, Missouri had the greatest amount of basis variability for feeder cattle. However, feeder basis variability in these two markets is still significantly less than stocker basis variability in Torrington, Wyoming, the least variable stocker market. La Junta, Colorado and St. Joseph, Missouri have the greatest amount of stocker basis variability.

Torrington, Wyoming had the largest average stocker volume which may explain the reduction in basis variability, but this market also has the greatest variability in stocker volume. The two stocker markets with the smallest average weekly volume, Clovis and Vienna, had basis variability in the mid range of all ten markets. Basis variability for the feeder markets also appears to be related to the level of volume. Clovis and Vienna are two of the smaller markets and they had the greatest feeder basis variability. While Kearney is one of the larger markets with the smallest feeder basis variability.

Results of the regression equation to explain basis variability are displayed in Table 2 for stocker cattle and Table 3 for feeder cattle. The adjusted R^2 values ranged from 0.13 to 0.36 for stocker cattle and from 0.09 to 0.34 for feeder cattle.

The cash variable was significant and positive in nine out of ten markets for stocker cattle. The implication is that as the cash market level increases, basis variability increases. Volume was significant and negative in eight markets and standard deviation of volume was significant and positive in seven stocker markets. This would substantiate our hypothesis that as the level of volume increases, basis variability decreases but as volume variability increases, basis variability also increases. Increases in weight variability led to a significant increase in basis variability in seven markets, as we hypothesized. Basis variability decreased significantly for a stocker contract month in only two markets. Basis variability actually increased significantly for a contract month for one market. The implications are that the effect of contract month on stocker basis variability is inconclusive.

Feeder cattle basis variability increased significantly with a higher cash price level in eight of ten feeder cattle markets. An increase in volume decreased basis variability in six markets while an increase in volume variability only significantly increased basis variability in half of the markets. Basis variability increased as weight variability increased in seven of the feeder cattle markets. Basis variability during feeder cattle contract months decreased in four of the markets.

Compared to stocker cattle, feeder cattle basis variability appears to be a little less sensitive to volume in some markets. This does not appear to be related to the size of the market, or the relative volume of stocker versus feeder cattle in each market.

Summary

Knowledge of basis level and basis variability is important to hedgers. An increase in basis variability increases the risk that remains with a hedger. As basis risk increases, the attractiveness of using the underlying futures to place a hedge decreases. The failed CME stocker contract never attracted enough volume to remain a viable contract. One possible explanation for this contract failure is that the basis risk associated with it was large enough to discourage producers from using the contract to hedge calves.

Basis variability was compared in ten different markets for 550 pound steers and for 750 pound steers using the CME stocker and feeder indexes as a proxy for the futures prices. Both of these contracts are cash settled using these indexes, so one would expect they are a close proxy. We found in all ten markets that basis variability for the 550 pound stocker steers was significantly greater than basis variability for 750 pound feeder steers. Was this increased basis variability enough added risk to limit the use of the stocker contract to hedge 550 pound steers?

We hypothesized that the volume in a market, or more precisely the lack of adequate volume in a market, would contribute to basis variability. Our results substantiated this hypothesis. We also found that as volume variability increased, basis variability also increased. An increase in the general price level for steer calves and an increase in the variability of weight of calves also contributed to an increase in basis variability. Lastly, we hypothesized that basis variability would be reduced during future market contract months. Our results did not substantiate this hypothesis.

References

Bailey, D.., M.C. Peterson and B.W. Brorsen. 1991. "A Comparison of Video Cattle Auctions and Regional Market Prices." *Amer. J. Agr. Econ*. 73:465-475.

Feuz, D.M. and W.J. Umberger. 2000 "Hedging Effectiveness and Basis Variability for different Weight Feeder Steers Using the CME Stocker and Feeder Futures." Selected paper presented at the Southern Ag. Econ. Association Meetings, Lexington, KY. January 31 - February 2.

Sartwelle, J.D. III, J.R. Mintert, F.K. Brazle, T.C Schroeder, R.P. Bloze, Jr., and M. R. Langemeier. 1996. "Improving the Value of Your Calf Crop: The Impact of Selected Characteristics on Calf Prices." Cooperative Extension Service, Kansas State University. MF-2142. January.

Umberger, 1998. "A Risk-Return Comparison of Various Retained Ownership Programs Using Alternative Pricing Strategies." Masters Thesis. Department of Economics. South Dakota State University.

Table 1. Basis and volume mean and standard deviation (bottom number) for stocker and feeder cattle in ten different markets from Jan. 1993 to Sep. 2001.

	Stocker		Feeder	
Market	Basis ($/cwt.)	Volume (head)	Basis ($/cwt.)	Volume (head)
Ada, OK	-0.99	136.27	-0.94	41.17
	3.2487^{ef}	73.3676	$2.1291b^{c}$	38.1525
Billings, MT	0.54	76.01	-0.95	42.86
	3.6607^{g}	90.6556	2.3073^{cd}	54.1965
Clovis, NM	-1.98	55.91	-3.01	68.45
	3.5674^{fg}	47.6163	2.4311^{d}	72.7774
Dodge City, KS	-0.73	122.76	0.27	122.76
	3.3424^{efg}	117.0532	1.6609^{a}	117.0532
Kearney, NE	2.99	180.53	1.98	374.76
	3.4671^{fg}	179.3316	1.6382^{a}	317.9758
La Junta, CO	1.39	223.04	-0.69	200.45
	4.1110^{h}	220.7821	2.3391^{cd}	192.8533
St Joseph, MO	-0.16	154.42	0.61	207.08
	4.1148^{h}	158.9697	1.9363^{b}	158.4756
Torrington, WY	3.90	396.50	1.58	451.02
	3.1142^{e}	309.7550	2.0775^{b}	315.3478
Vienna, MO	-2.05	56.61	-1.35	22.75
	3.5661^{fg}	40.2587	2.4287^{d}	29.6083
W Fargo, ND	-0.19	97.51	0.29	227.14
	3.2935^{ef}	106.2327	2.0635^{b}	231.0242

Note: Increasing superscripts (a-h) denotes that basis variability is significantly greater at the .05 level of confidence.

Table 2. Results of regression of selected independent variables on the standard deviation of basis against the CME stocker contract for ten different markets.

	Ada	Billings	Clovis	Dodge City	Kearney	La Junta	St Joseph	Torrington	Vienna	W Fargo
Intercept	-0.717	1.990*	1.055*	0.275	-0.195	0.122	3.116*	-1.704*	0.236	0.884*
	(0.3860)	(0.5827)	(0.4290)	(0.4627)	(0.4342)	(0.7989)	(0.7594)	(0.4695)	(0.3101)	(0.4124)
Cash	0.029*	0.010*	0.023*	0.019*	0.036*	0.028*	0.001	0.053*	0.028*	0.018*
	(0.0032)	(0.0052)	(0.0039)	(0.0040)	(0.0039)	(0.0070)	(0.0077)	(0.0045)	(0.0028)	(0.0043)
Volume	-0.000	-0.016*	-0.009*	-0.008*	-0.004*	-0.006*	-0.002	-0.003*	-0.016*	-0.004*
	(0.0010)	(0.0037)	(0.0041)	(0.0023)	(0.0009)	(0.0015)	(0.0024)	(0.0006)	(0.0038)	(0.0014)
SDVolume	0.001	0.011*	-0.006	0.007*	0.003*	0.005*	-0.005	0.002*	0.008*	0.009*
	(0.0026)	(0.0042)	(0.0041)	(0.0022)	(0.0013)	(0.0018)	(0.0031)	(0.0008)	(0.0030)	(0.0018)
SDWeight	0.030*	0.033*	0.054*	0.074*	0.013	0.043*	0.049	-0.017	0.057*	0.022*
	(0.0148)	(0.0099)	(0.0115)	(0.0121)	(0.0081)	(0.0179)	(0.0260)	(0.0092)	(0.0106)	(0.0079)
Contract	0.080	-0.048	0.148	0.225	-0.468*	0.938*	-0.232	0.267	0.098	-0.705*
	(0.0790)	(0.1653)	(0.1275)	(0.1518)	(0.1745)	(0.2812)	(0.3339)	(0.1688)	(0.0755)	(0.1592)
Adj R^2	0.17	0.20	0.22	0.27	0.36	0.13	0.14	0.35	0.30	0.20

Note: An asterisk denotes the coefficient is significant at the .05 level.

Table 3. Results of regression of selected independent variables on the standard deviation of basis against the CME feeder contract for ten different markets.

	Ada	Billings	Clovis	Dodge City	Kearney	La Junta	St Joseph	Torrington	Vienna	W Fargo
Intercept	1.178*	-1.973*	0.562*	0.551*	0.451*	3.124*	0.378	1.816*	-0.614	-0.613*
	(0.2600)	(0.3982)	(0.2484)	(0.2435)	(0.2170)	(0.3552)	(0.3252)	(0.4386)	(.3279)	(0.2638)
Cash	0.008*	0.044*	0.014*	0.012*	0.007*	-0.012*	0.013*	0.006	0.029*	0.028*
	(0.0029)	(0.0050)	(0.0033)	(0.0029)	(0.0027)	(0.0043)	(0.0034)	(0.0045)	(0.0040)	(0.0030)
Volume	-0.013*	-0.008*	-0.004*	0.001	-0.001*	-0.003*	-0.001	-0.002*	0.003	-0.000
	(0.0027)	(0.0035)	(0.0015)	(0.0008)	(0.0002)	(0.0008)	(0.0006)	(0.0002)	(0.0060)	(0.0004)
SDVolume	0.015*	0.007*	0.004*	-0.003*	0.002*	0.000	-0.002*	0.001*	-0.002	-0.000
	(0.0026)	(0.0026)	(0.0017)	(0.0010)	(0.0004)	(0.0010)	(0.0008)	(0.0004)	(0.0042)	(0.0006)
SDWeight	-0.004	0.022*	0.025*	0.004	0.030*	0.016*	0.036*	-0.005	0.016*	0.022*
	(0.0042)	(0.0047)	(0.0050)	(0.0066)	(0.0045)	(0.0046)	(0.0065)	(0.0059)	(0.0042)	(0.0041)
Contract	0.025	-0.053	-0.246*	-0.110*	-0.337*	0.010	0.021	-0.107	-0.005	-0.236*
	(0.0545)	(0.1011)	(0.0609)	(0.0551)	(0.0520)	(0.0904)	(0.0659)	(0.0916)	(0.0756)	(0.0616)
Adj R^2	0.09	0.22	0.17	0.09	0.34	0.19	0.31	0.15	0.12	0.33

Note: An asterisk denotes the coefficient is significant at the .05 level.