13. Live Cattle Futures and Options Pricing

Brian Coffey **<bcoffey@ksu.edu>**

Brian teaches undergraduate courses in production economics and futures markets. His research is focused on the scholarship of teaching and learning, consumer demand analysis, and livestock economics. Before joining the K-State faculty, Brian taught for several years in Central Asia and consulted for a variety of small, private agribusinesses in the region. He has a B.S. and M.S. in Agricultural Economics from the University of Kentucky and a Ph.D. in Agricultural Economics from Kansas State University.

Abstract/Summary

The volatility of the live cattle futures contract price has been the topic of much debate and concern over the past several months. Many in the industry who rely on the contract to manage price risk worry that this increased volatility, and the live cattle contract price, is being driven by factors other than fundamental slaughter cattle supply and demand. If this is the case, the contract will be less effective in its primary use—hedging price risk in the cash market for slaughter cattle. This presentation will examine the live cattle futures prices over time. Specifically, predicted feeding profitability in the futures market (the spread between the feeder cattle and live cattle contract) will be simulated across time and compared to cash returns to feeding. It will also examine the pricing of options on the live cattle contract, with a focus on whether the efficiency of options prices have changed over time. The goal will be to establish some objective measures relating the connectedness of the live cattle contract to the cash market for live cattle. Results will serve as guidelines for future discussion and research regarding the evolution and future of the live cattle contract.

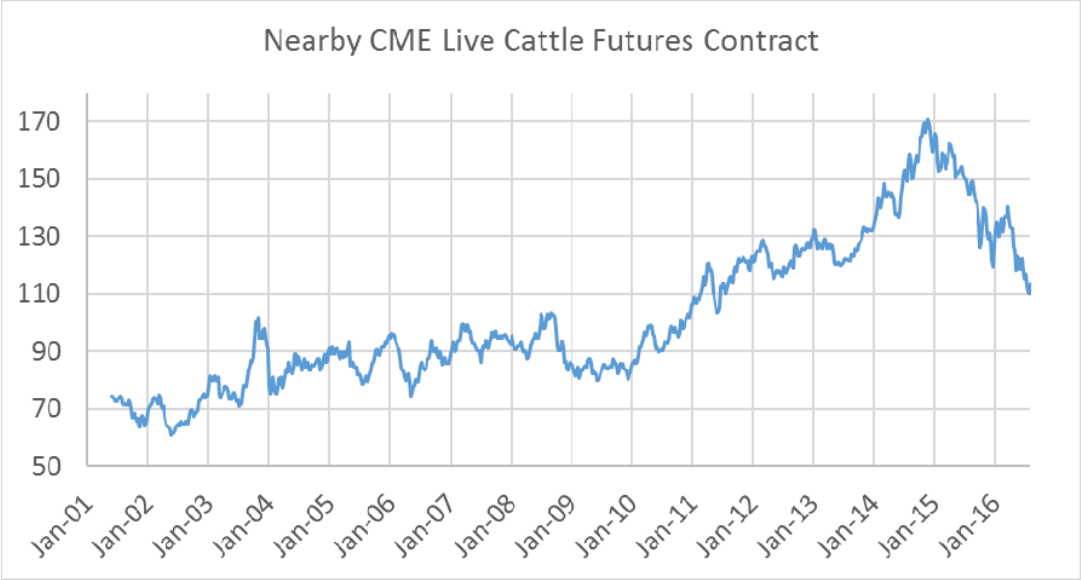
Hedging Using the Live Cattle Futures Contract

Brian Coffey
Assistant Professor
Kansas State University

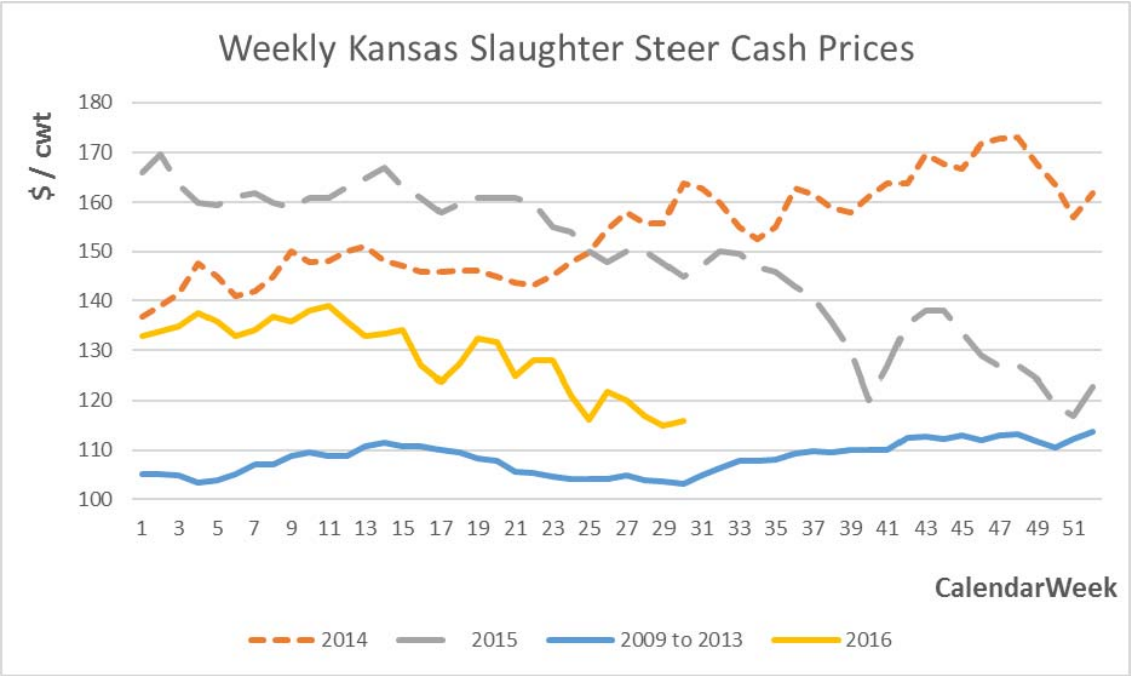
KSU Risk and Profit Conference
Manhattan, KS
August 18-19, 2016

Why all the concern?

- In 2014 cash prices for slaughter cattle rapidly climbed to all-time highs
- Prices movements within the yeare were also large, relative to those in previous years
- In 2015 cash prices for slaughter cattle fell back down to levels near the average of the previous few years



Futures Market Data Source: CRB Nearby Weekly Average Live Cattle Contract

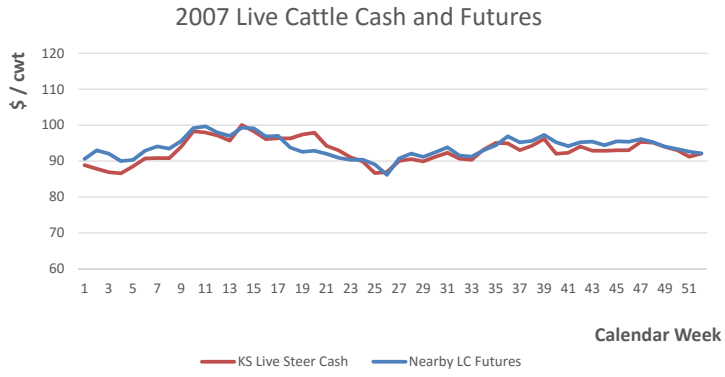


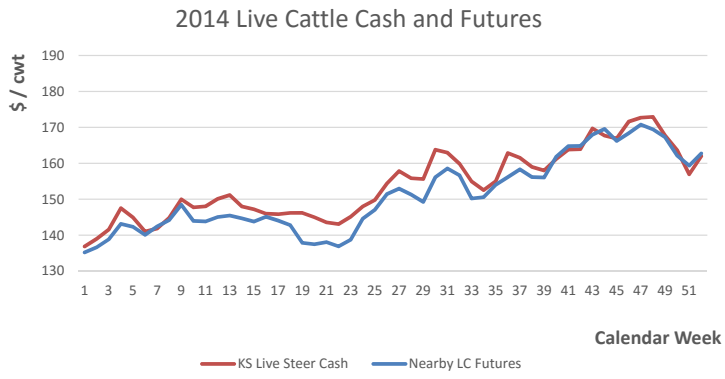
Data Source: USDA-AMS

Livestock Marketing Information Center

Why all the concern?

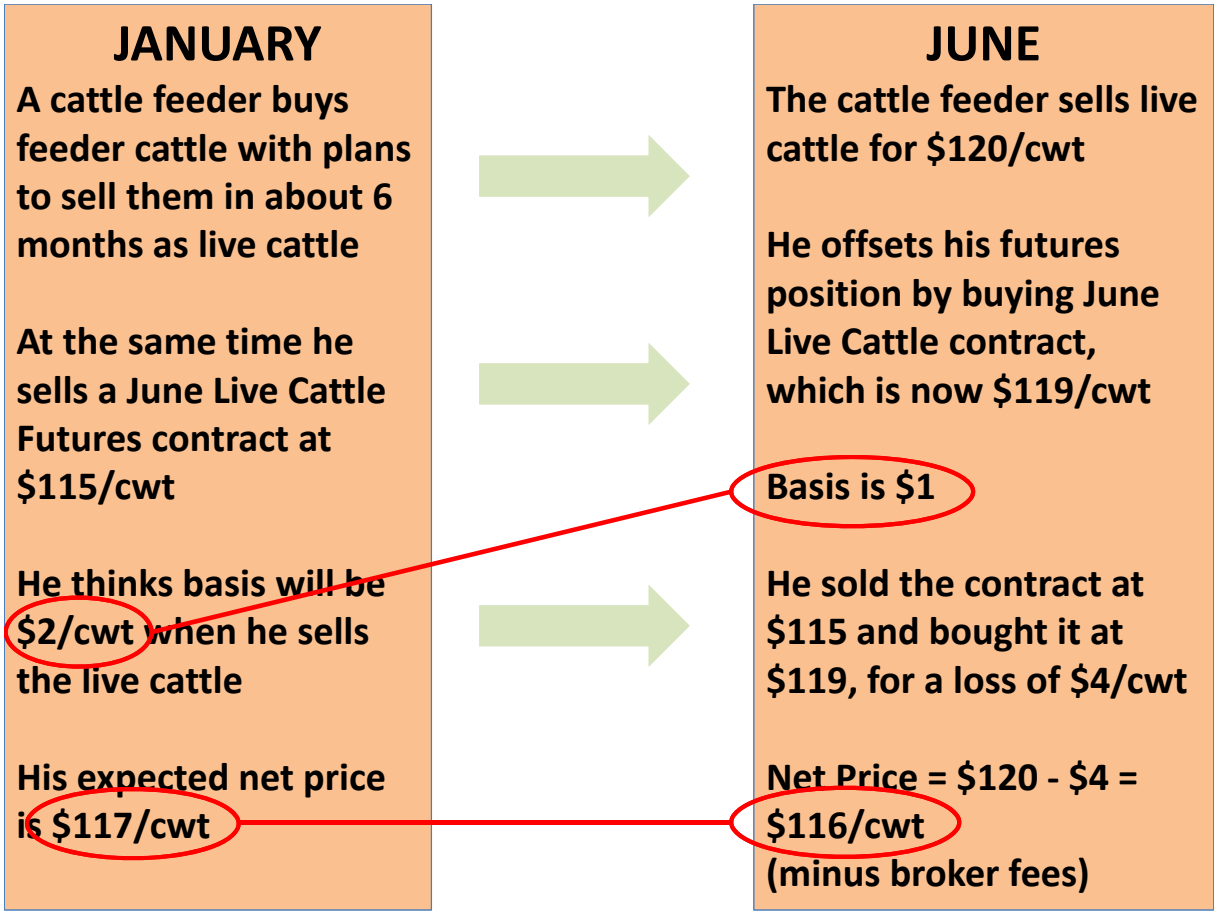
- One way to manage cash market risk (in any year) is by using futures markets to hedge
- Producers selling slaughter cattle can hedge the sale using the CME Live Cattle Contract
- The risk management strategy depends on basis—the difference between cash and futures prices





Futures Market Data Source: CRB Nearby Weekly Average Live Cattle Contract

Data Source: USDA-AMS, Livestock Marketing Information Center



Hedging

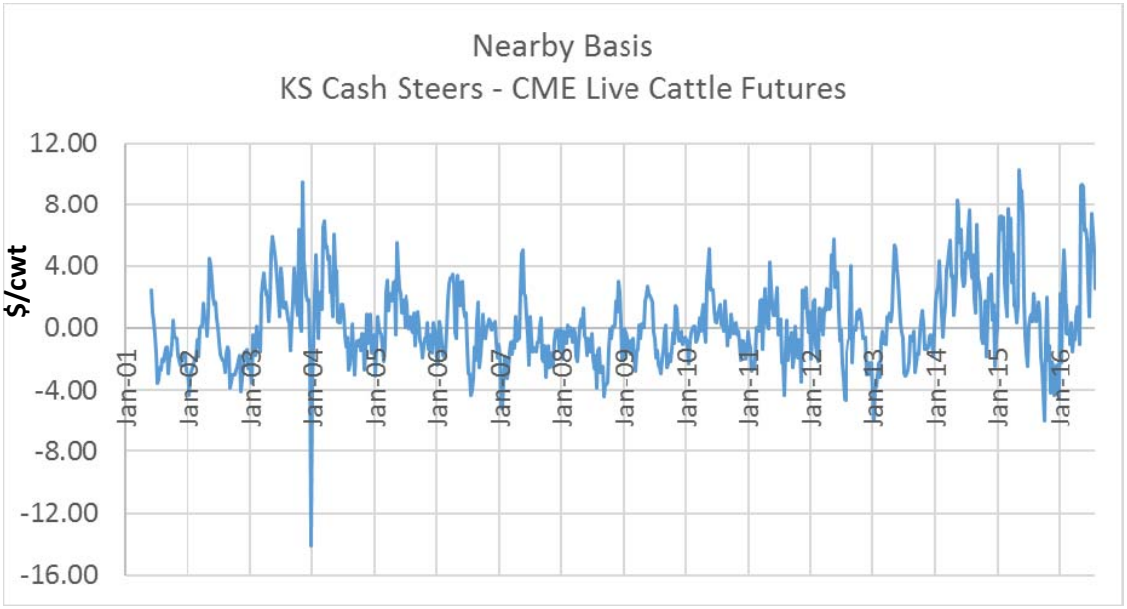
- Hedging protects from downside risk and eliminates possible gain from upside risk
- The success of a hedge is measured by ability to receive the expected net price you targeted
- This success depends entirely on ability to predict basis
- A hedge allows a producer to trade flat price risk for basis risk

Objectives

- Examine how ability to manage live cattle price risk using the CME live cattle contract has changed since 2001
- Specifically, measure how a basis prediction strategy would have performed from 2001 to now and test if there are differences in performance associated with specific years or futures contracts

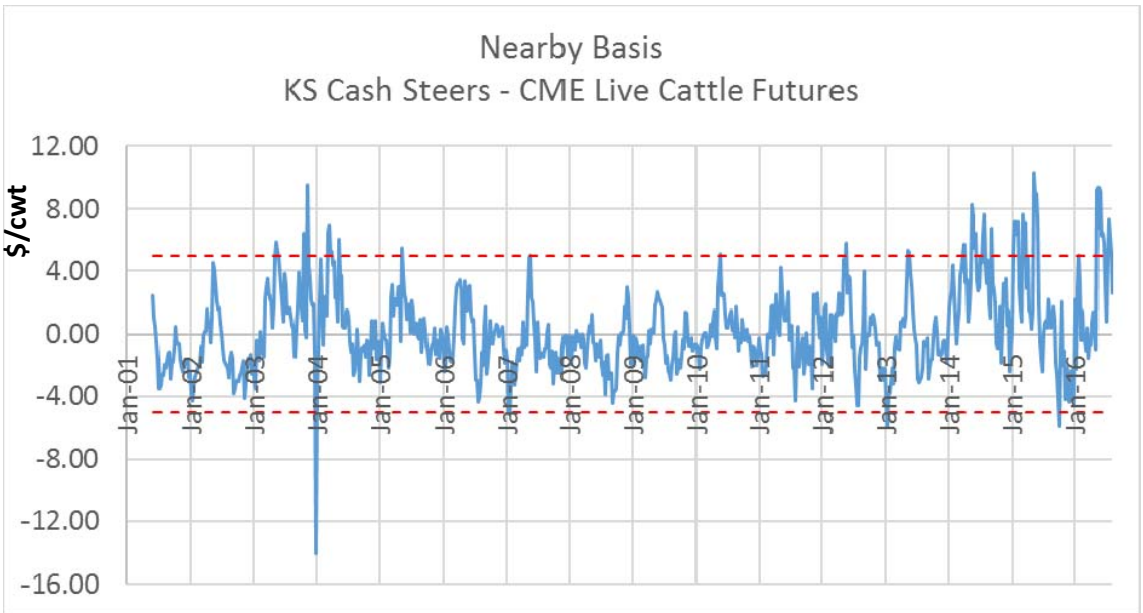
Comparing Basis Prediction Across Years

- Calculated basis for every calendar week since June 1, 2001 (just after Mandatory Price Reporting began)
- Kansas Slaughter Steer weekly average price (LMIC)
- Nearby CME Live Cattle Futures weekly average (CRB)
- KS Cash Price – Futures = Actual Basis



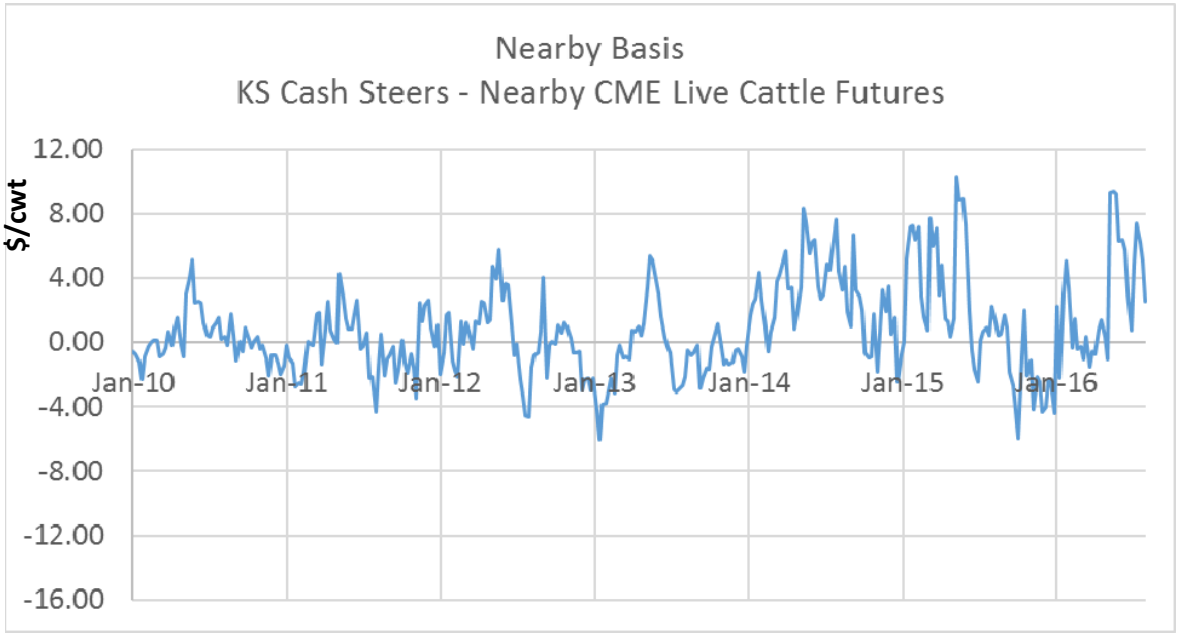
Futures Market Data Source: CRB Nearby Weekly Average Live Cattle Contract

Cash Price Data Source: USDA-AMS, Livestock Marketing Information Center



Futures Market Data Source: CRB Nearby Weekly Average Live Cattle Contract

Cash Price Data Source: USDA-AMS, Livestock Marketing Information Center

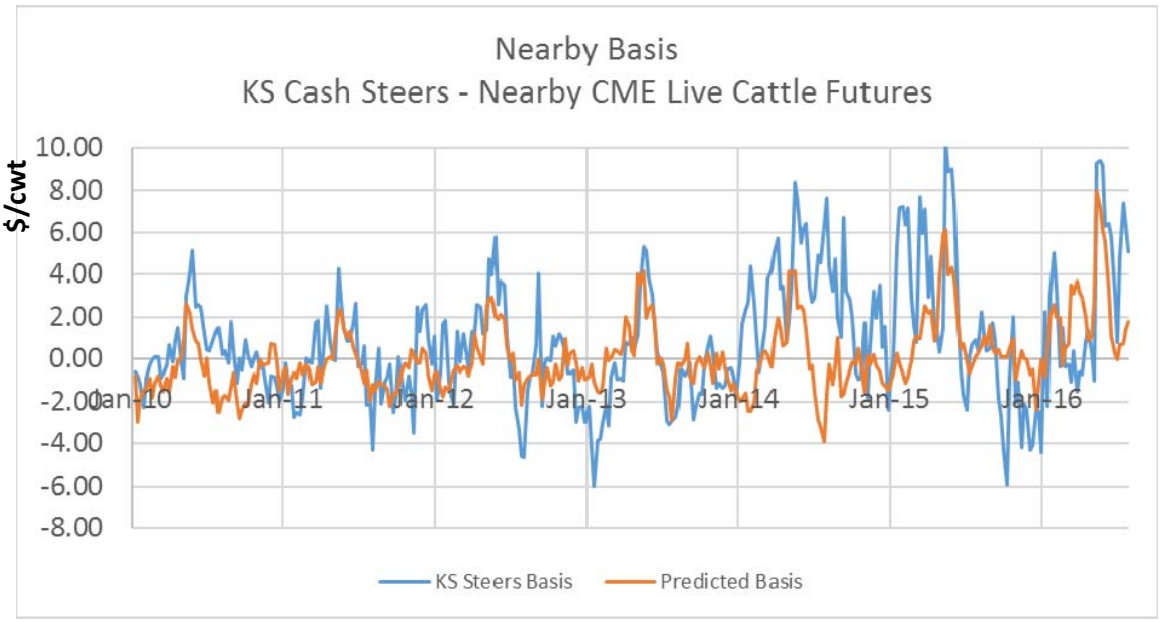


Futures Market Data Source: CRB Nearby Weekly Average Live Cattle Contract

Cash Price Data Source: USDA-AMS, Livestock Marketing Information Center

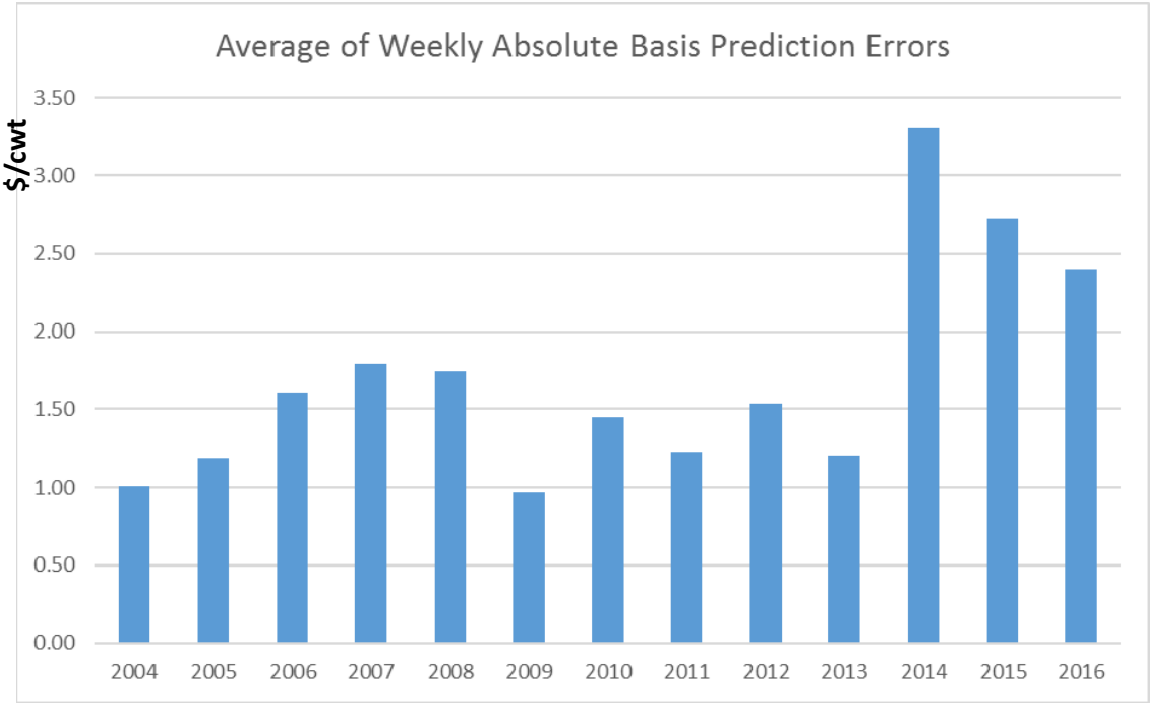
Comparing Basis Prediction Across Years

- There are many ways to try to predict basis
- In this study, the three year weekly average of a calendar week is used
- For example—In week 2 of 2004, predicted basis would be the average of the week 2 basis for 2001, 2002, and 2003
- That leaves a series of basis predictions from 2004 to 2016



Futures Market Data Source: CRB Nearby Weekly Average Live Cattle Contract

Cash Price Data Source: USDA-AMS, Livestock Marketing Information Center



Futures Market Data Source: CRB Nearby Weekly Average Live Cattle Contract

Cash Price Data Source: USDA-AMS, Livestock Marketing Information Center

Differences in Prediction Errors

- We can statistically explain the basis prediction errors
- Look at some major factors that have changed over time as errors have changed and identify relationships between the two

Differences in Prediction Errors

- Some factors of interest
  - Year specific effects
  - Futures contract used
- Many other candidates…

Differences in Prediction Errors

- Based on June 2004 to July 2016
- Over this time period, in KS, there are no differences in errors across futures contracts
- In other words, you are as likely to predict basis when hedging with the Jun contract or Dec contract
- Statistically, years 2004 to 2013 are the same in terms of predicting basis

Differences in Prediction Errors

- There are large year effects for 2014, 2015, and 2016
- On average, hedgers had absolute basis prediction errors that were:
  - $2.29/cwt larger in 2014 (compared to 2009)
  - $1.76/cwt larger in 2015 (compared to 2009)
  - $1.32/cwt larger in 2014 (compared to 2009)

KANSAS STATE UNIVERSITY | Department of Agricultural Economics

Differences in Prediction Errors

- Some factors of interest
  - Year specific effects
  - Futures contract used
  - % Cattle in the KS market sold as negotiated cash trades
- Many other candidates…

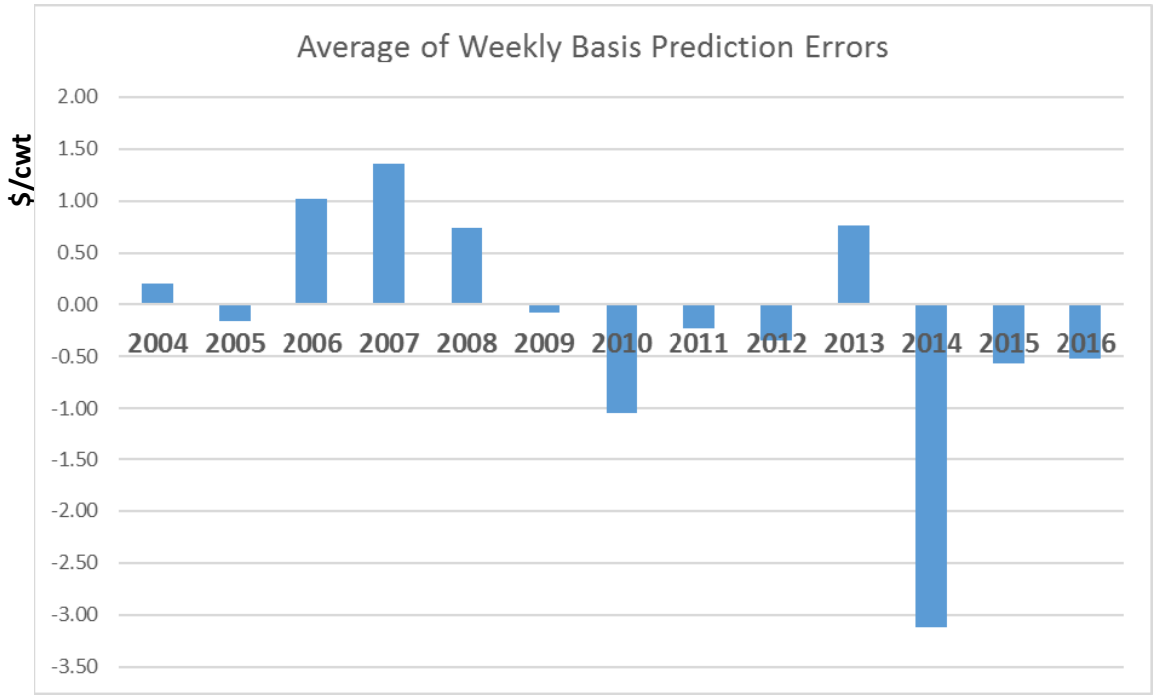
Differences in Prediction Errors

- Based on June 2008 to July 2016
- Over this time period, in KS, there are no differences in errors across futures contracts
- 2014, 2015, 2016 still have significantly larger prediction errors than other years
- This preliminary analysis shows that the percent cattle that were sold in KS as negotiated cash trade has no impact on ability to predict basis

KANSAS STATE UNIVERSITY | Department of Agricultural Economics

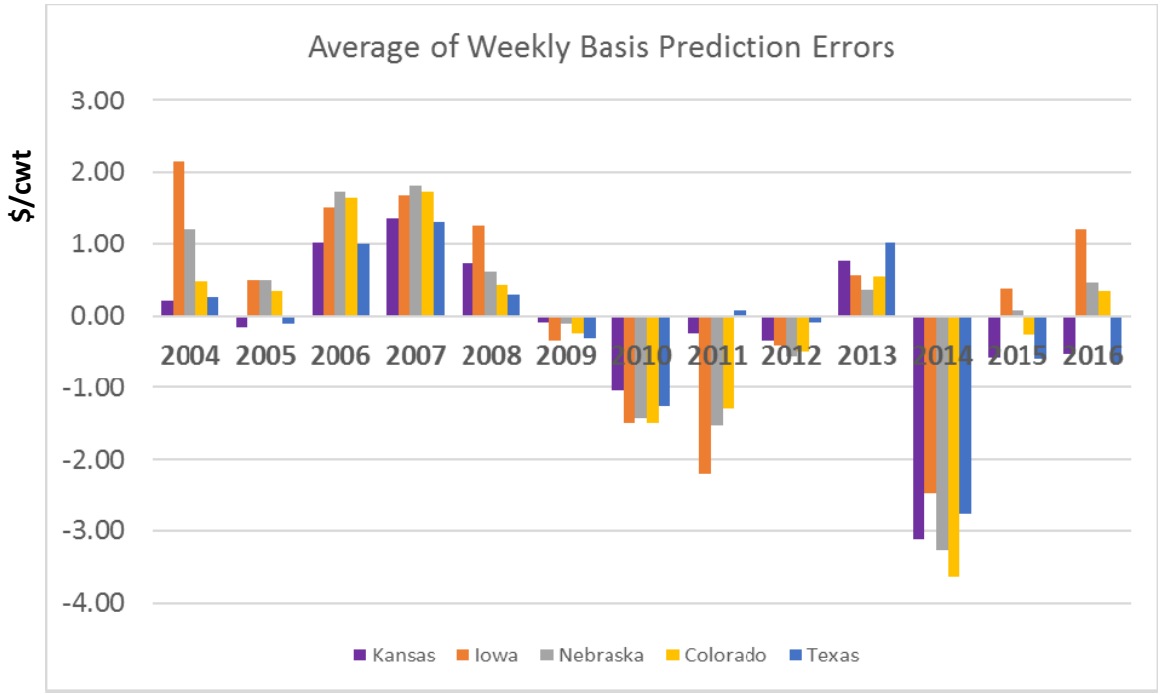
Good Errors or Bad Errors?

- In terms of ability to manage price (or revenue) risk with the live cattle futures contract, we are concerned with the absolute errors of basis prediction
- Whether the basis prediction error is positive or negative impacts a producer's bottom line
- For example, if a cattle feeder guesses low on basis (negative prediction error) his actual price will be higher than expected



Futures Market Data Source: CRB Nearby Weekly Average Live Cattle Contract

Cash Price Data Source: USDA-AMS, Livestock Marketing Information Center



Futures Market Data Source: CRB Nearby Weekly Average Live Cattle Contract

Cash Price Data Source: USDA-AMS, Livestock Marketing Information Center

Good Errors or Bad Errors?

- 2014 saw a negative bias of prediction errors
- Across the entire year, using the 3-year average basis as a prediction, hedgers were likely guess low on basis
- This results in higher (lower) than expected net prices for short (long) hedgers

Good Errors or Bad Errors?

- 2015 and 2016 have seen smaller prediction errors but a lack of consistency across regions of those errors

Summary and Points to Consider

- 2014, 2015, and 2016 (so far) have been difficult years in which to predict basis, compared to 2004-2013
- All live cattle contracts seem equally useful to KS producers, in terms of absolute hedging effectiveness
- 2015 and 2016 basis prediction errors show increased disparity across regions of the US

Limitations and Concerns

- Did not consider major contract changes
- Weeks until expiration can be important
- Considering different basis prediction rules would create a more complete picture
- Did not consider the possibility of increased margin calls due to increased volatility of futures prices

So What?

- I'd like your help in thinking through the next questions:
  - Has something significant changed to the point that we reconsider predicting/defining basis?
  - What economic factors could be driving the increased differences and geographic disparity in basis prediction errors?

Brian Coffey
Department of Agricultural Economics
Kansas State University

Office: 785-532-5033
Email: bcoffey@ksu.edu