11. An Updated Look at Live Cattle Price Discovery

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.

Glynn Tonsor **<gtonsor@ksu.edu>**

Glynn Tonsor is an Associate Professor in the Department of Agricultural Economics at Kansas State University (KSU). Glynn grew up on a farrow-to-finish swine farm in Monroe City, Missouri. Tonsor obtained a B.S. from Missouri State University and Ph.D. from KSU. He was a faculty member at Michigan State University from May 2006 to March 2010 when he joined the KSU faculty. Tonsor has broad interests and experiences which span issues throughout the meat supply chain. Through active research, engaged outreach with industry, and first-hand knowledge with livestock production, Glynn has economic expertise in an array of topics of importance to Kansas, U.S. and global stakeholders. These topics include animal identification and traceability, animal well-being and welfare, commodity market analysis, consumer demand, food safety, meat labeling policies, producer perceptions and preferences, risk management, and technology acceptance. Glynn's integrated research and extension program has resulted in multiple journal article publications and numerous outreach contributions. Glynn and his wife, Shauna, live in Saint George, Kansas with their children Ethan, Levi, and Aubree.

Dustin Pendell **<dpendell@ksu.edu>**

Dustin Pendell joined the Department of Agricultural Economics as an Associate Professor in 2015. He received his BS in Agribusiness from Illinois State University, MS in Agribusiness Economics from Southern Illinois University and PhD in Agricultural Economics from Kansas State. His research and extension programs are focused in the areas animal health and livestock production economics. He teaches a course at the undergraduate level in data analysis and optimization. Prior to joining K-State, Dustin was a faculty member at Colorado State University where he conducted research on economic issues surrounding animal health and livestock and meat marketing. He has also taught undergraduate and graduate courses in agricultural marketing, production economics, and farm management.

Abstract/Summary

Over the past several years, methods of live cattle marketing and pricing have changed. One notable shift has been that, at the national level, the proportion of all live cattle sold on a dressed basis has steadily increased. At the same time the proportion of negotiated purchases made on a dressed basis has declined. It is unclear how these two trends—the former indicating an increased aggregate importance of dressed marketing and the latter a smaller influence of dressed marketings on reported prices—interact to influence live price discovery in cash and futures markets. We will map out these changes at the national level and in Kansas and Nebraska to give a picture of how live cattle marketing has changed over time. After that, we show results from statistical analysis that measures the relative importance of live and dressed negotiated prices in the live cattle price discovery process.

Price Discovery in Negotiated Cash Live Cattle Markets

Brian Coffey, Dustin Pendell, and Glynn Tonsor
Kansas State University

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Price Discovery

- The process of settling on a price for some good or service
- Potential sellers make offers at certain prices
- Potential buyers make bids at certain prices
- When there is agreement goods/services are provided to buyers by sellers
- This back-and-forth process of negotiated is the work of price discovery

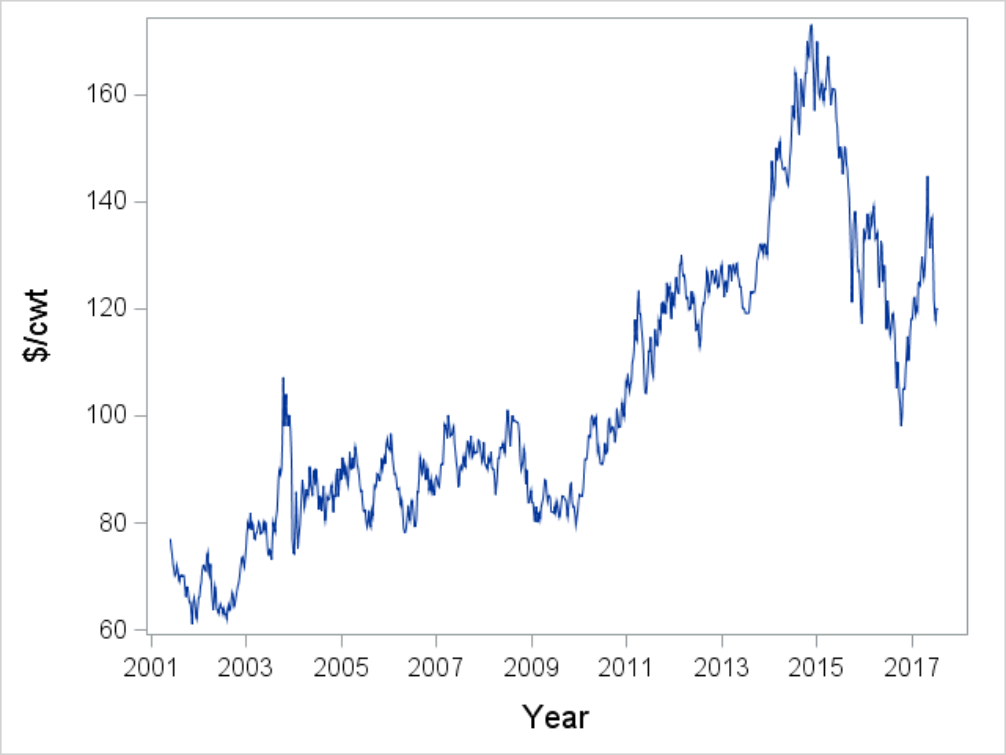
Price Discovery

- Live cattle markets and marketing methods have changed over the past several years
- Updating our understanding of price discovery dynamics in the negotiated live cattle markets will be helpful to industry participants and policy makers

Details About the Data

- Cash markets
- Negotiated transactions of slaughter steers and heifers
- Weekly from June 2001 to July 2017
- Weekly Price = weighted average of the slaughter steer and heifer prices for that week

Average Weekly Cash Negotiated Price for Kansas Slaughter Steers and Heifers



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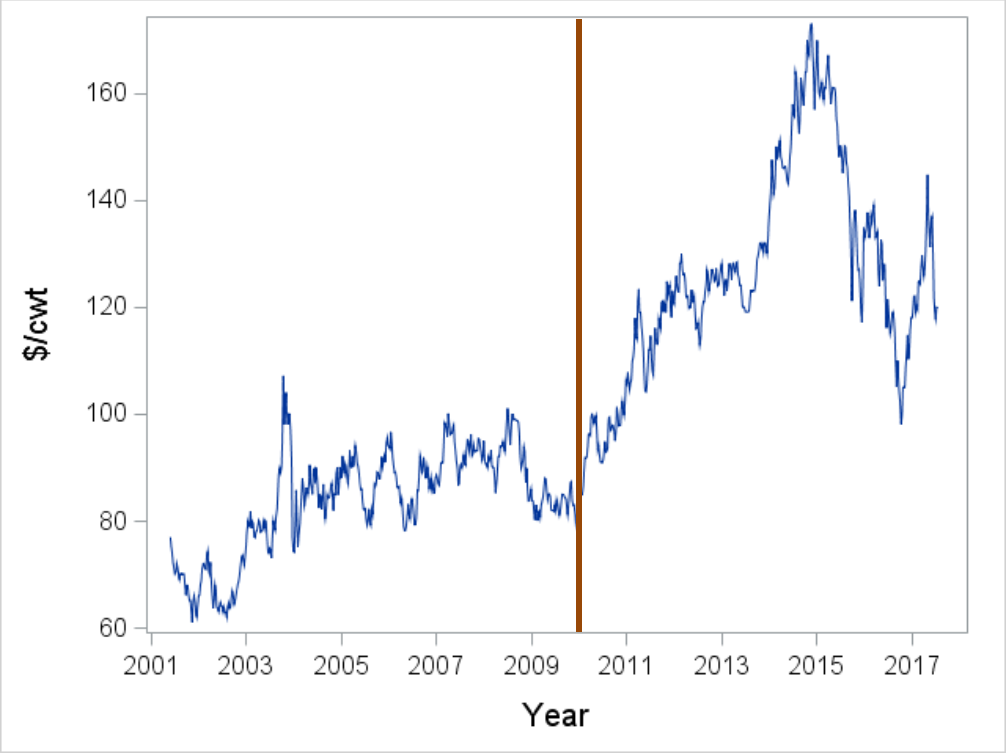

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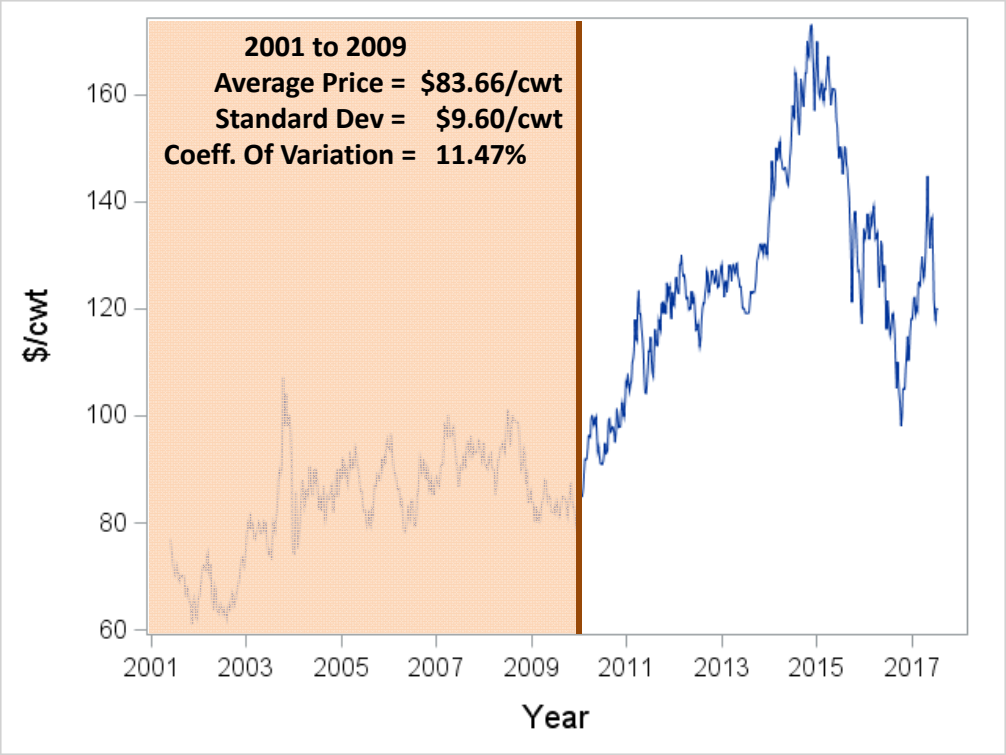

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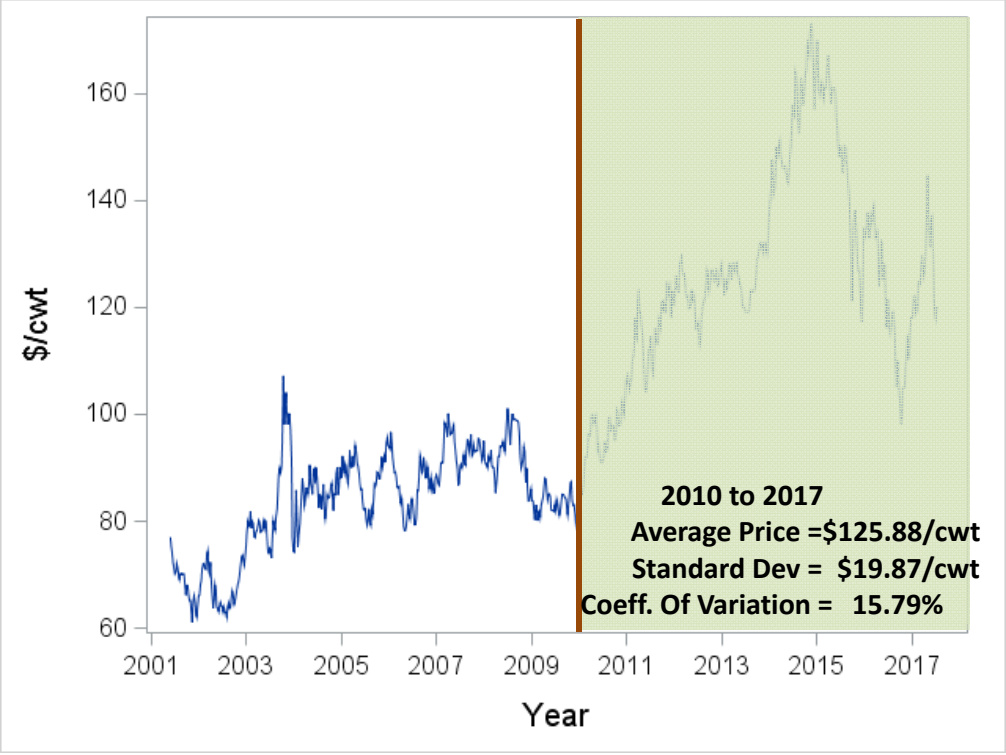

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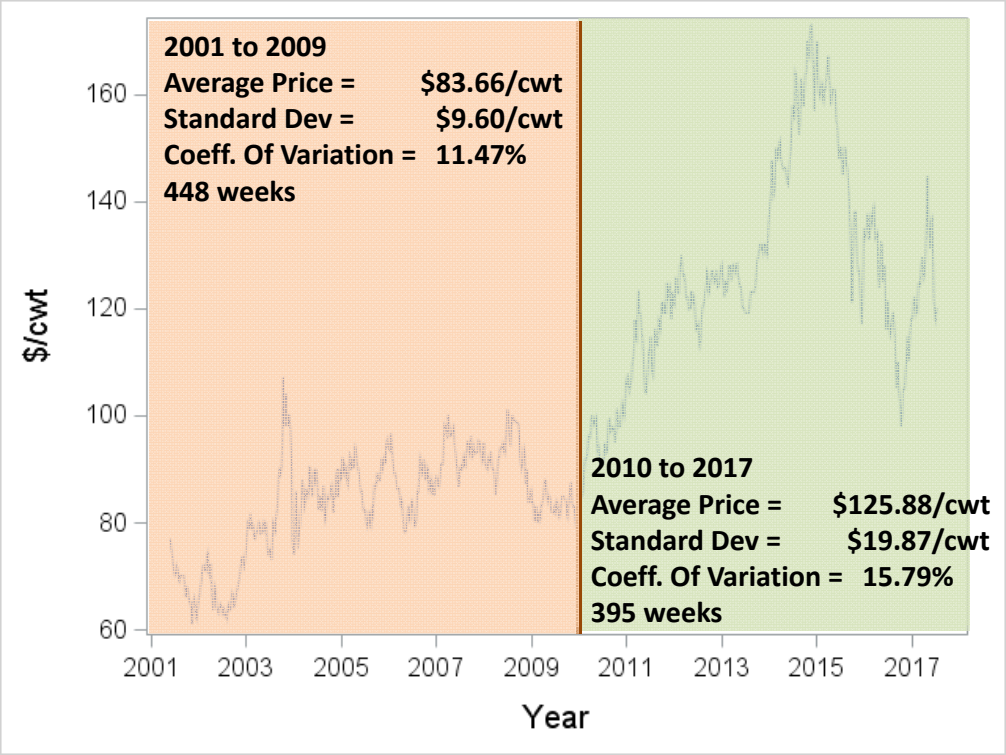
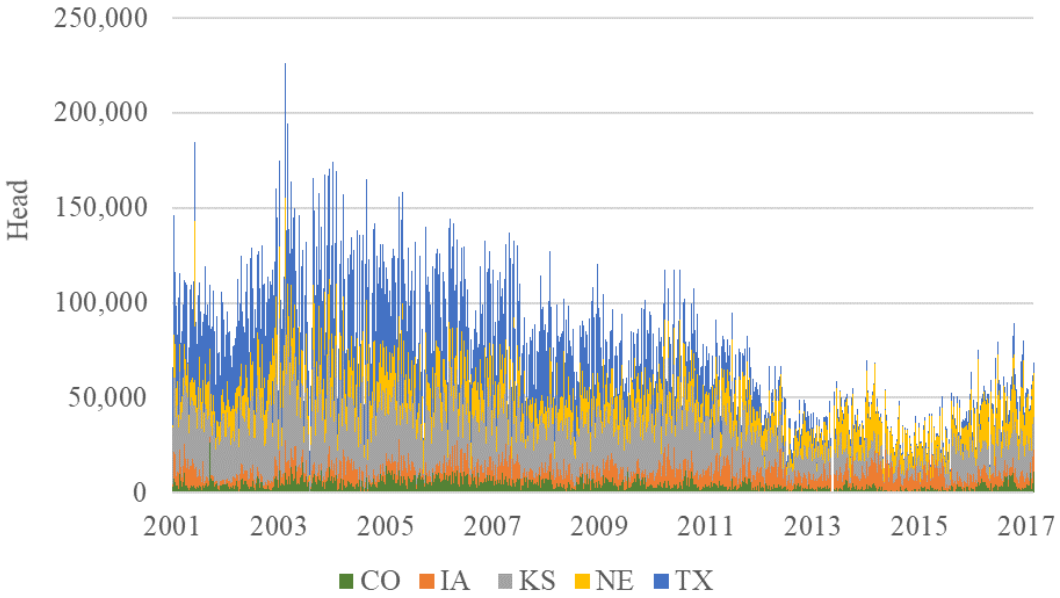


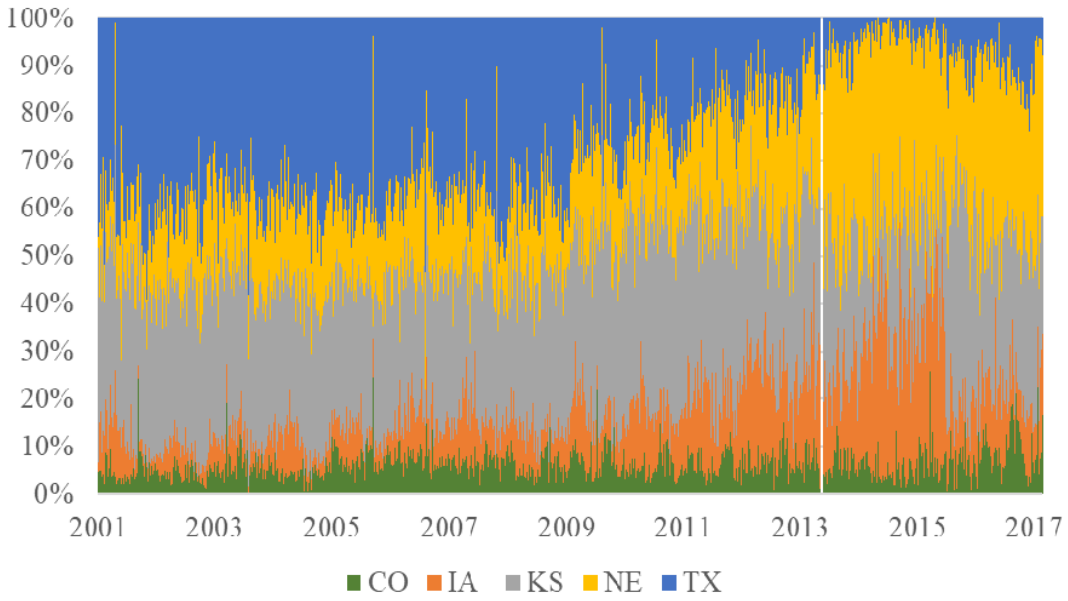
Slaughter Steers and Heifers Sold from the Five Major Reporting Regions



Head is calculated as total slaughter steers and heifers in a given region.

The white space corresponds with the 2013 federal government shutdown.

Percentage of Slaughter Steers and Heifers from the Five Major Reporting Regions



Percentages are calculated as slaughter steers and heifers in a given region as a percentage of all slaughter steers and heifers in all five regions.

The white space corresponds with the 2013 federal government shutdown.

How Prices Relate to Each Other

- Past Prices Effect Current Prices
  - We usually call this a causal relationship
  - Example: The price of slaughter steers in KS this week might effect bids and offers in TX next week or the week after
  - We can test this statistically
  - We have to assume some structural relationship

How Prices Relate to Each Other

- Relationship can include current prices
  - Example: This week's price of slaughter steers in KS might effect bids and offers in TX this week
  - We can test this statistically
  - This approach is entirely based on the data
  - No structural assumptions
  - Referred to as Directed Graphs

Live Cattle Prices

- Analyze negotiated slaughter steer and heifer prices in the five major price reporting areas
- Comparisons
- Time periods: 2001 to 2009 and 2010 to 2017
- Relationships: Effect of past prices and Relationship including current prices

Effect of past prices

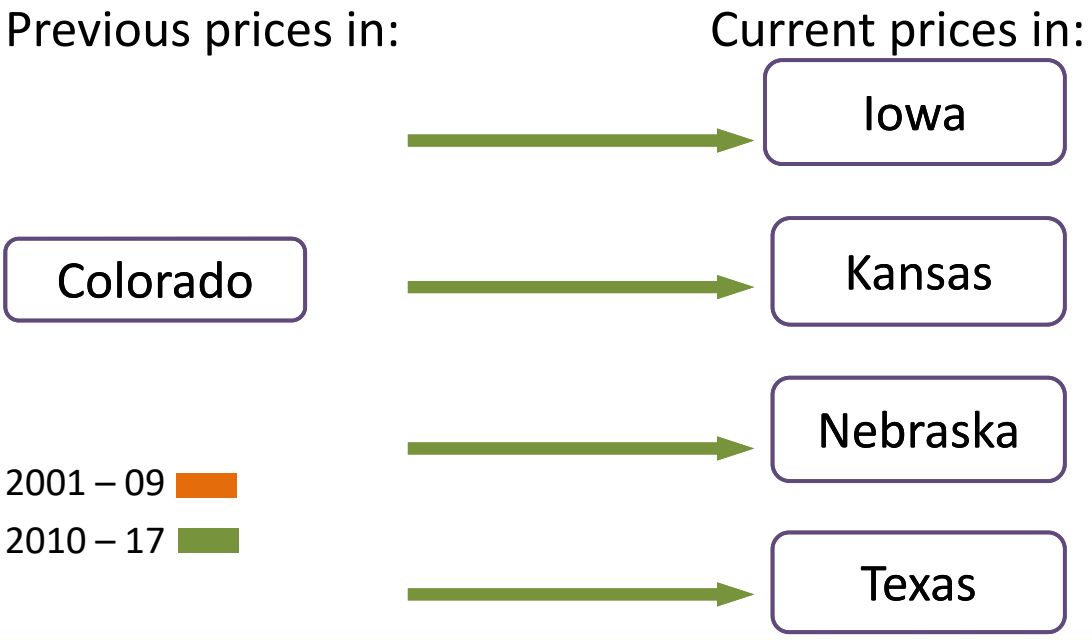
- In the following slides:

Indicates that past prices of one market help explain current prices in another during 2001 to 2009

Indicates that past prices of one market help explain current prices in another during 2010 to 2017

No arrow indicates there is no effect

Impacts of Past Two Weeks' Prices 2001-09 and 2010-17



Impacts of Past Two Weeks' Prices 2001-09 and 2010-17

Previous prices in:

Current prices in:

Colorado

Iowa

Kansas

Nebraska

2001 – 09

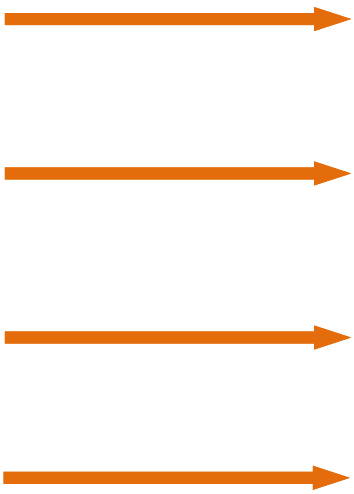
2010 – 17

Texas

Impacts of Past Two Weeks' Prices 2001-09 and 2010-17

Previous prices in:

Current prices in:



Colorado

Kansas

Iowa

Nebraska

2001 – 09

2010 – 17

Texas

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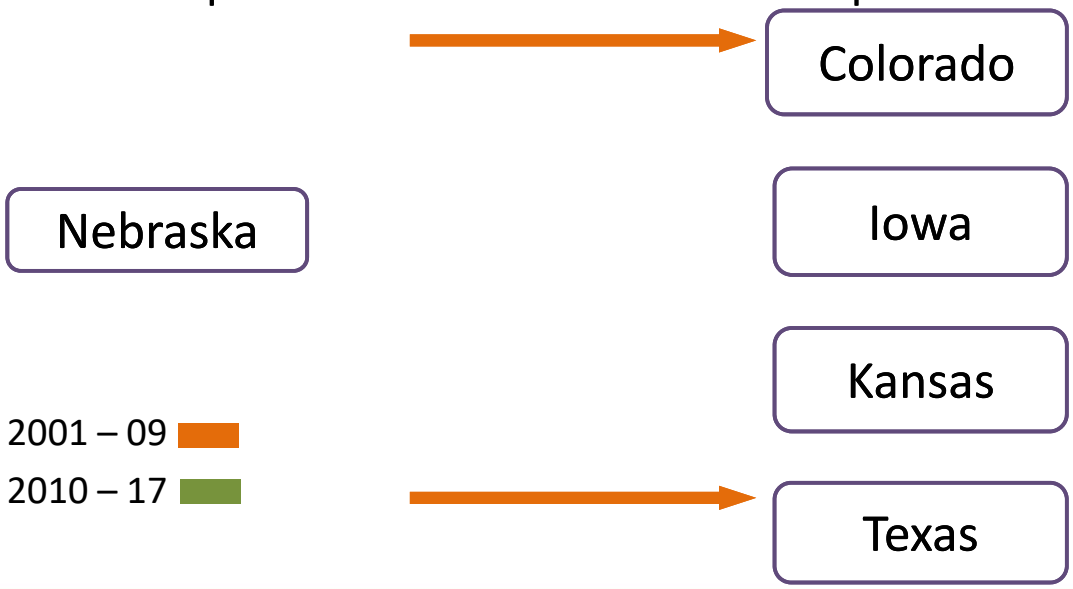
Impacts of Past Two Weeks' Prices 2001-09 and 2010-17



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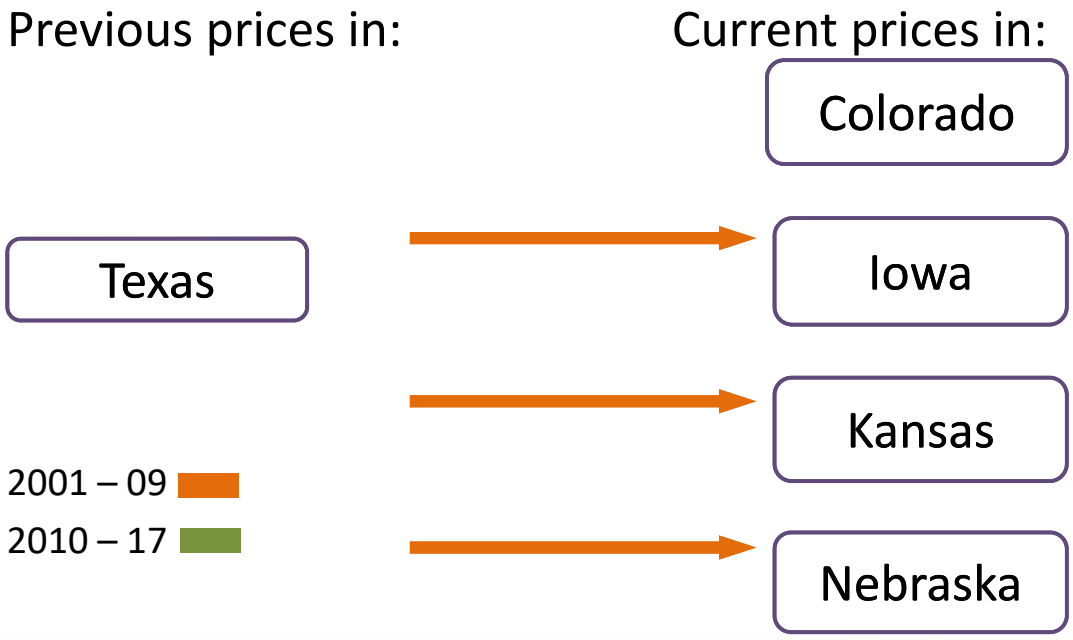

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Current Prices (Directed Graphs)

- For 2001 to 2009:

Indicates that information of current prices in one market directly influence prices in another

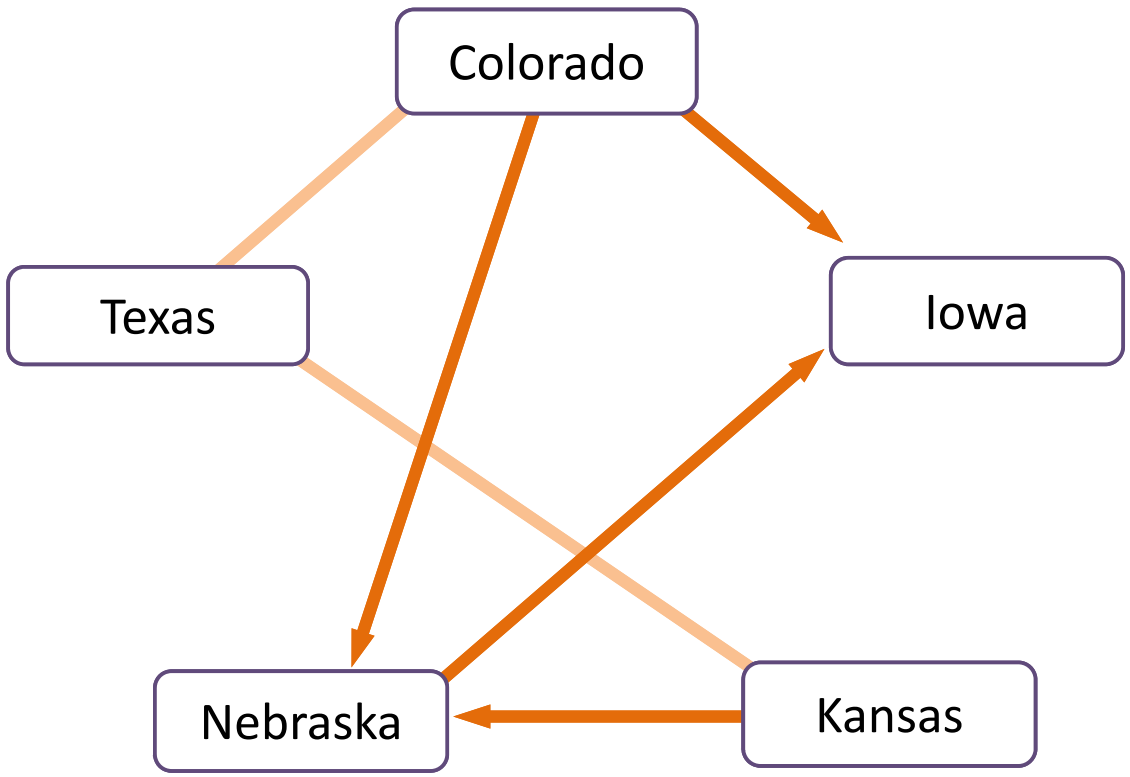
Indicates a relationship but unknown direction

- For 2010 to 2017:

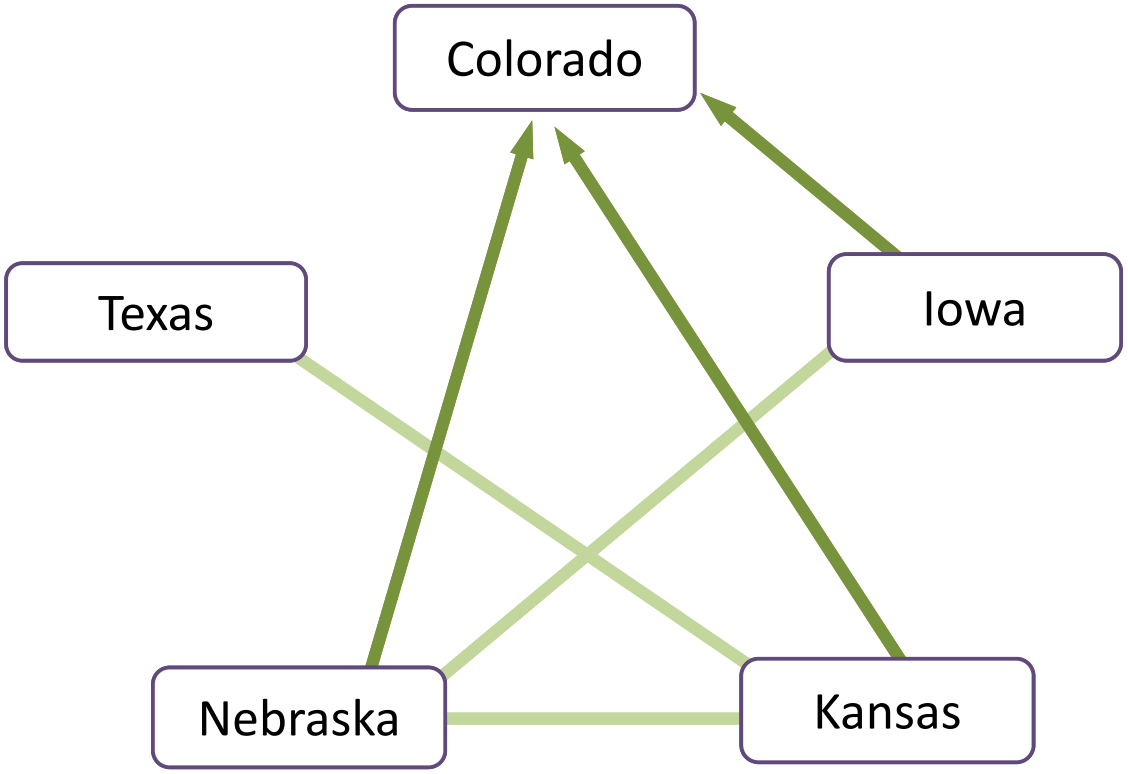
Indicates that information of current prices in one market directly influence prices in another

Indicates a relationship but unknown direction

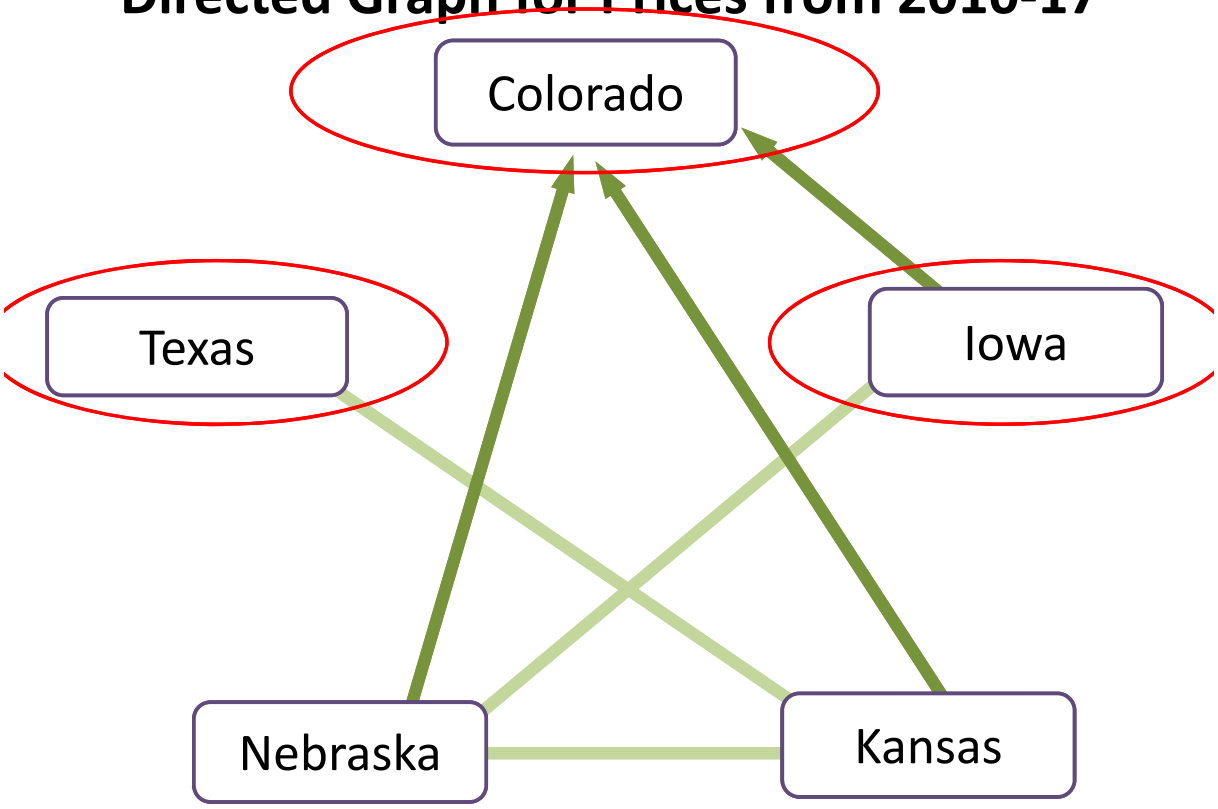
Directed Graph for Prices from 2001-09



Directed Graph for Prices from 2010-17



Directed Graph for Prices from 2010-17



Conclusions: Past Prices

- In 2001-09, KS and TX tended to lead the negotiated cash markets. That is prices from these regions from one to two weeks earlier impacted current week's prices
- In 2009-17, this relationship has changed. Previous prices in CO lead other negotiated cash markets

Conclusions : Past Prices

- Previous prices in IA did not lead markets in either period

Conclusions : Directed Graphs

- Fewer causal relationships between markets in the more recent period (3 vs. 4)
- In 2001 to 2009 IA tended to the information sink
- In 2010 to 2017 CO took on that role

Conclusions : Directed Graphs

- IA, NE, KS, TX are related but we can't determine the directional effect
- One possibility is that they are connected by a price series not included (e.g., dressed price series or live cattle futures price)

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Conclusions : Consistency?

- Looking at past prices, the CO market is influential over other markets
- Directed Graph analysis shows that CO absorbs information but doesn't affect other markets
- Both of these could be true
  - For example, if, in a given week, buyers and sellers consult current week prices in some regions and past reported prices in other regions, this would be the case.

Concerns/Further Research

- Dressed markets not considered
- Futures prices not considered
- 2014-15 prices were extreme in level and volatility
- Move forward to understand which markets are most useful for forecasting
- Determine what impacts could be expected if a certain market changes

We welcome any questions, suggestions or feedback.

Brian Coffey
Department of Agricultural Economics
Kansas State University

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

Supplemental Slides

Summary Stats of Live Cattle Prices 2001 to 2017

Region	Mean	StDev	CV	Min	Max	N
Colorado	103.71	26.40	25.46	61.37	173.14	843
Iowa	102.95	26.10	25.35	61.73	170.14	843
Kansas	103.44	26.04	25.17	60.99	172.83	843
Nebraska	103.47	26.30	25.42	61.85	172.21	843
Texas	103.52	25.98	25.10	60.22	173.00	843

Supplemental Slides

Summary Stats of Live Cattle Prices 2001 to 2009

Region	Mean	StDev	CV	Min	Max	N
Colorado	83.63	9.65	11.54	61.37	112.58	448
Iowa	83.07	9.42	11.34	61.73	112.42	448
Kansas	83.66	9.60	11.47	60.99	107.08	448
Nebraska	83.46	9.59	11.49	61.85	113.04	448
Texas	83.75	9.63	11.49	60.22	107.30	448

Supplemental Slides

Summary Stats of Live Cattle Prices 2009 to 2017

Region	Mean	StDev	CV	Min	Max	N
Colorado	126.48	20.15	15.93	83.39	173.14	395
Iowa	125.49	19.90	15.86	83.41	170.14	395
Kansas	125.87	19.87	15.79	84.02	172.83	395
Nebraska	126.16	20.07	15.91	83.22	172.21	395
Texas	125.94	19.72	15.66	85.25	173.00	395

Directed Graph for Prices from 2001-17