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January 12, 2012

Whiteside Community Building
5917 W Mills Ave.
Hutchinson, KS

Kansas State University
Department of Agricultural Economics

Formulating Price Forecasts Using Readily Available Information

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Kansas State University

Partial support for this project (#11-IE-53102-072) provided by a grant from the USDA Risk Management Agency (RMA)

RMA

Why we don't try to "beat the market?"

- **Because we believe (and research largely supports):**
  - **"Efficient Market Hypothesis" holds**
    - **There is no systematic approach to regularly make money through futures and options market trades (e.g., hard to "beat the market")**
- **So it makes sense to understand basis and utilize futures market prices to obtain cash prices**
  - **So what is a crop or livestock producer to do???**

What is basis?

- **Basis is the difference between two prices.**
- **In commodity marketing, basis generally refers to the difference between a specific cash price and a specific futures market price.**
- **Mathematically: Basis = Cash – Futures**

Mathematical definition of basis…

(1) Basis = cash price - futures price

which can be rearranged to

(2) Cash price = futures price + basis

Producers are more interested in cash price than basis, thus equation (2) is the more important relationship.

Futures Prices and Basis estimates are readily available, which means *Cash Price forecasts are readily available…*

Basis…

- Generally, basis is more predictable than cash or futures prices due to:
  - Convergence
  - Futures and cash prices move together (same fundamental conditions generally affect both markets)
  - More year-to-year stability

Why are we interested in basis?

Basis can easily be used for projecting cash prices
{main focus for today}

Understanding basis can also be useful in:

- **Evaluating cash/contract bids**
- **Evaluating storage decisions**
- **Placing and lifting hedges**
- **Picking marketing strategies**
  (deciding which market to be in, e.g., cash vs. futures)

Forecasting basis…

- **Basis forecast = *f* (historical basis)**
- **Research has generally shown there is little benefit to complex fundamental models compared to historical averages.**
- **How accurate are forecasts?**
- **Is there a benefit to incorporating current information into forecast?**
- **Existing work largely pre-dates “ethanol era”**

Crop basis data at K-State…

- **Weekly data (Wednesday prices)**
  - **Corn, milo, soybeans, and wheat**
- **Nearby futures**
  - **rollover prior to delivery month**
- **48-week year**
- **Primary data sets**
  - **DTN data (many locations 10-15 years or less)**
  - **Wichita Eagle data (few locations ~30 years)**

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Marketing	Insurance and Risk	Projected Budgets	Production Economics	Links to Other Crop Information
Grain Market Outlook	Risk Management	Non-Irrigated Crops	Production	Enterprise Summaries
KSRN Grain Market Interview	Price Risk Management	Irrigated Crops	Precision Ag	Policy
Crop Basis Tool & Maps	Crop Insurance Price Histories	Decision Tools	Decision Tools	Storage & Handling
Grain Basis Issues	Decision Tools			Other Crop Links
Decision Tools	Interest Rate Forecasts			
Grain Supply and Demand				

Crops: Basis Maps and Interactive Tools

Crop Basis Maps	Crop Basis Tool

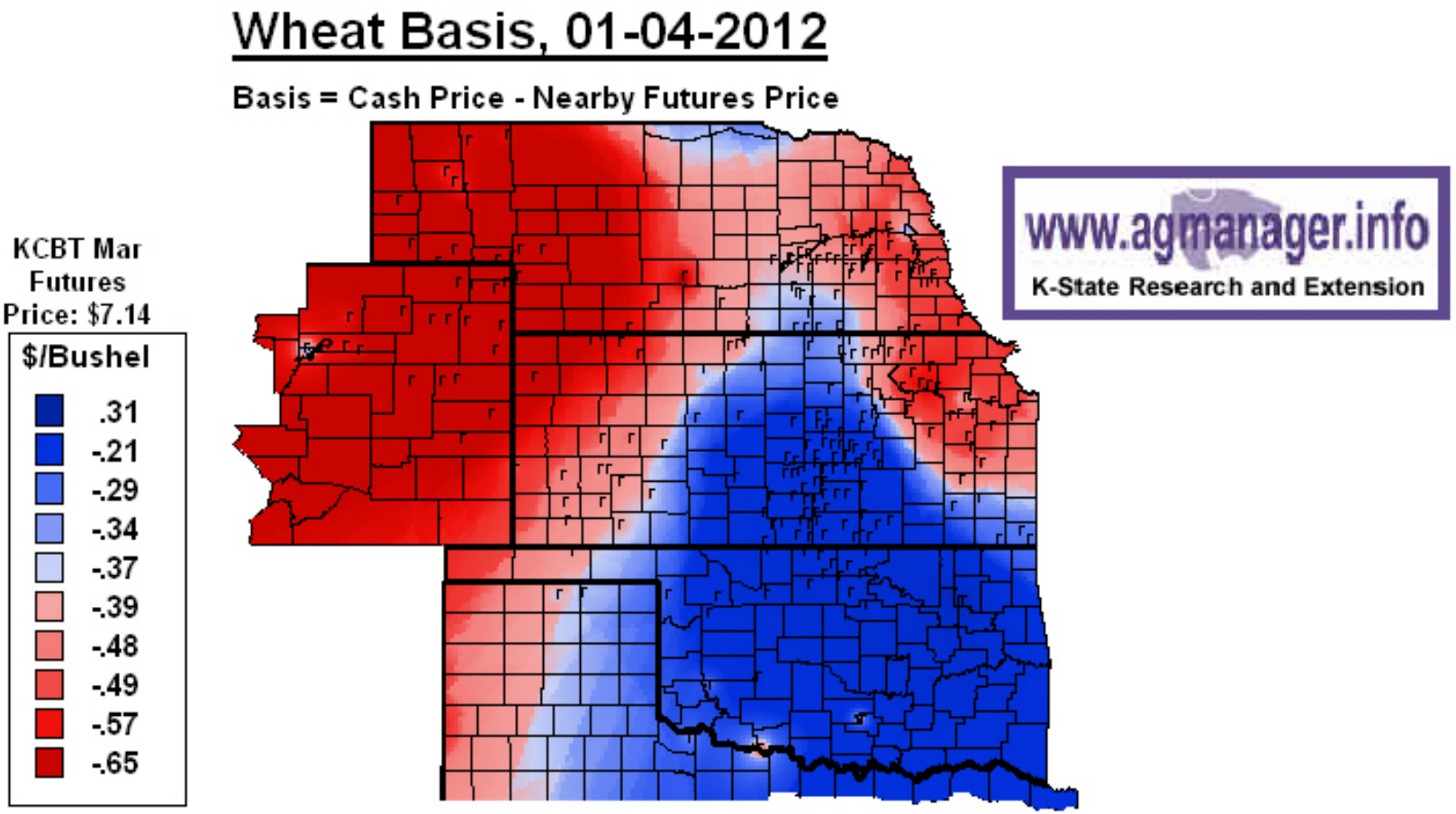
This weekly basis report provides a spatial analysis of crop basis in the Great Plains Region: Kansas, Nebraska, Missouri, Oklahoma, and parts of Colorado and Texas. Basis is calculated by subtracting the nearby futures price from the cash price, where nearby is defined as the futures contract closest to expiration without going into the delivery month. Basis captures the effects of local supply and demand, as well as transportation costs, on commodity prices.

The maps in this report are created from cash and futures prices that are collected and analyzed on each Wednesday of each month. The **basis maps** in this report show current basis levels for soybeans, corn, wheat, and grain sorghum (grain sorghum basis is calculated using the corn futures market). The **basis deviation maps** show the difference between the current basis and the three-year historical average basis for the same week and location.

Cash price data were collected for 500-900 locations, depending on the crop, and the information was analyzed in a Geographic Information System (GIS). Inverse distance methods were used to estimate the change in basis over space, which provides an estimate of the basis for observed and unobserved locations. A flag on the map denotes a location where cash prices were available. Care should be taken in interpreting basis estimates in portions of the Great Plains region where few or no cash prices were available.

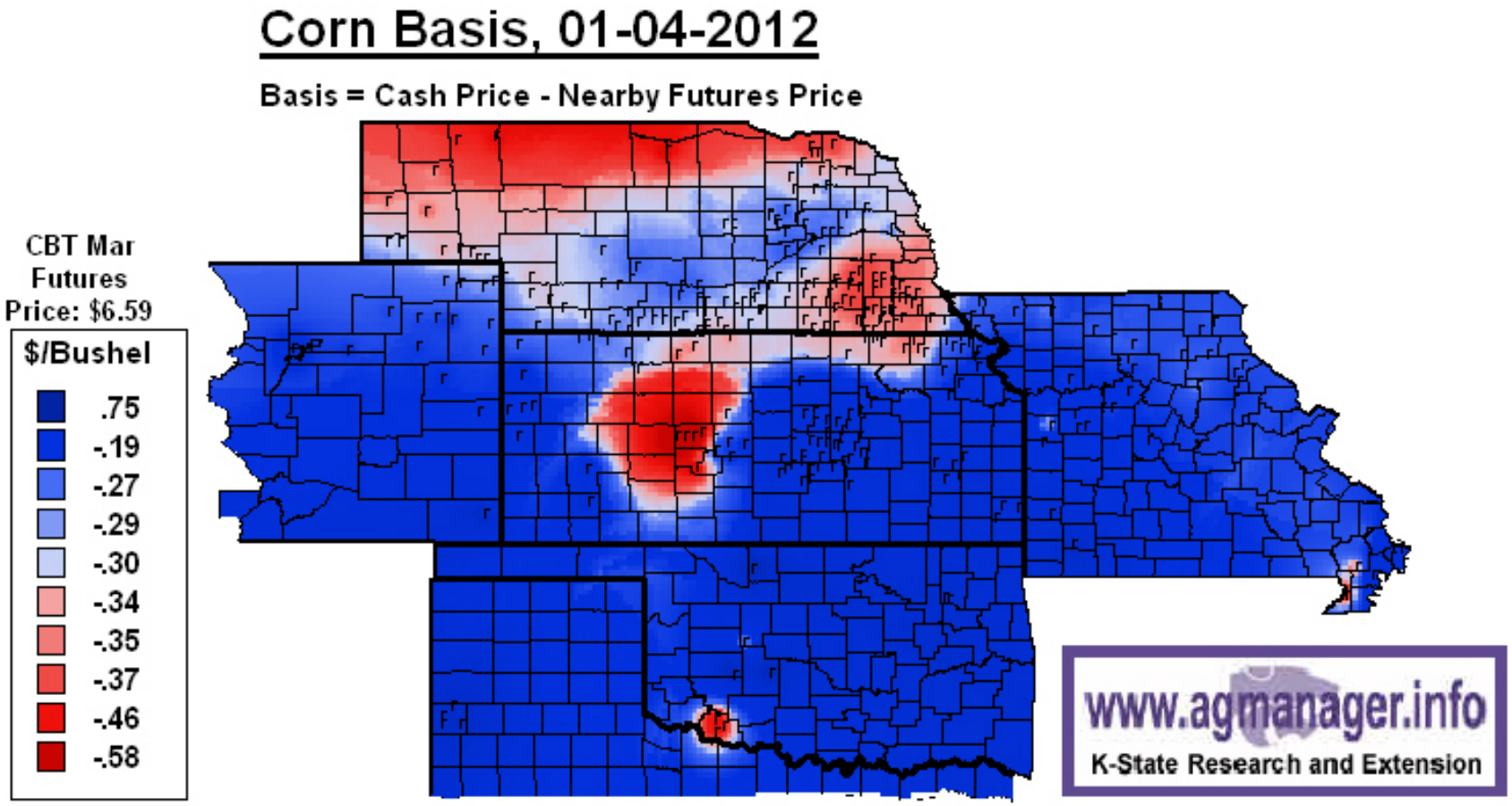
Kevin Dhuyvetter, K-State Ag. Economics (785-532-3527; kcd@ksu.edu)

Basis map on www.AgManager.info



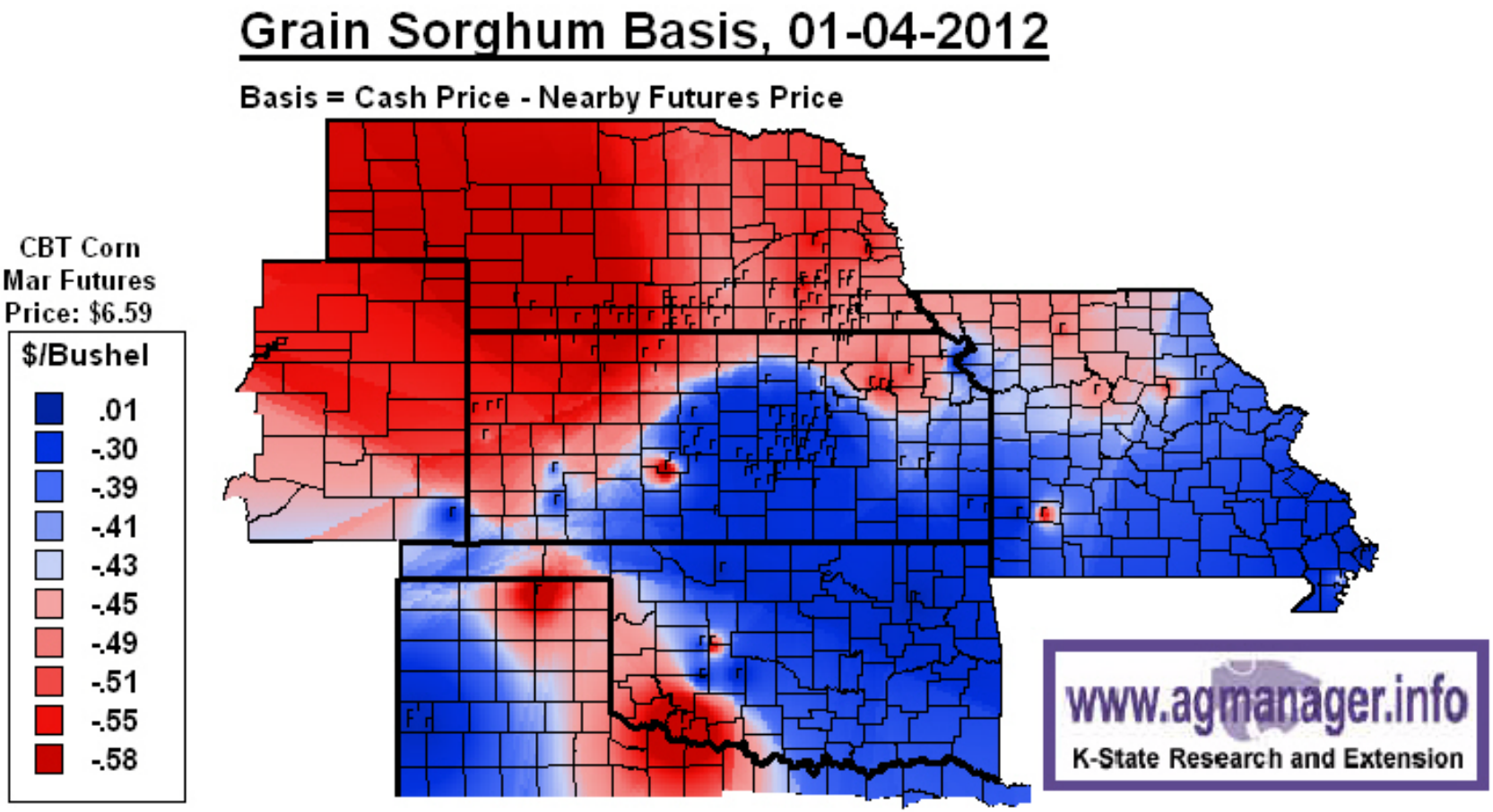
Strongest in central KS and weakest in western KS.

Basis map on www.AgManager.info



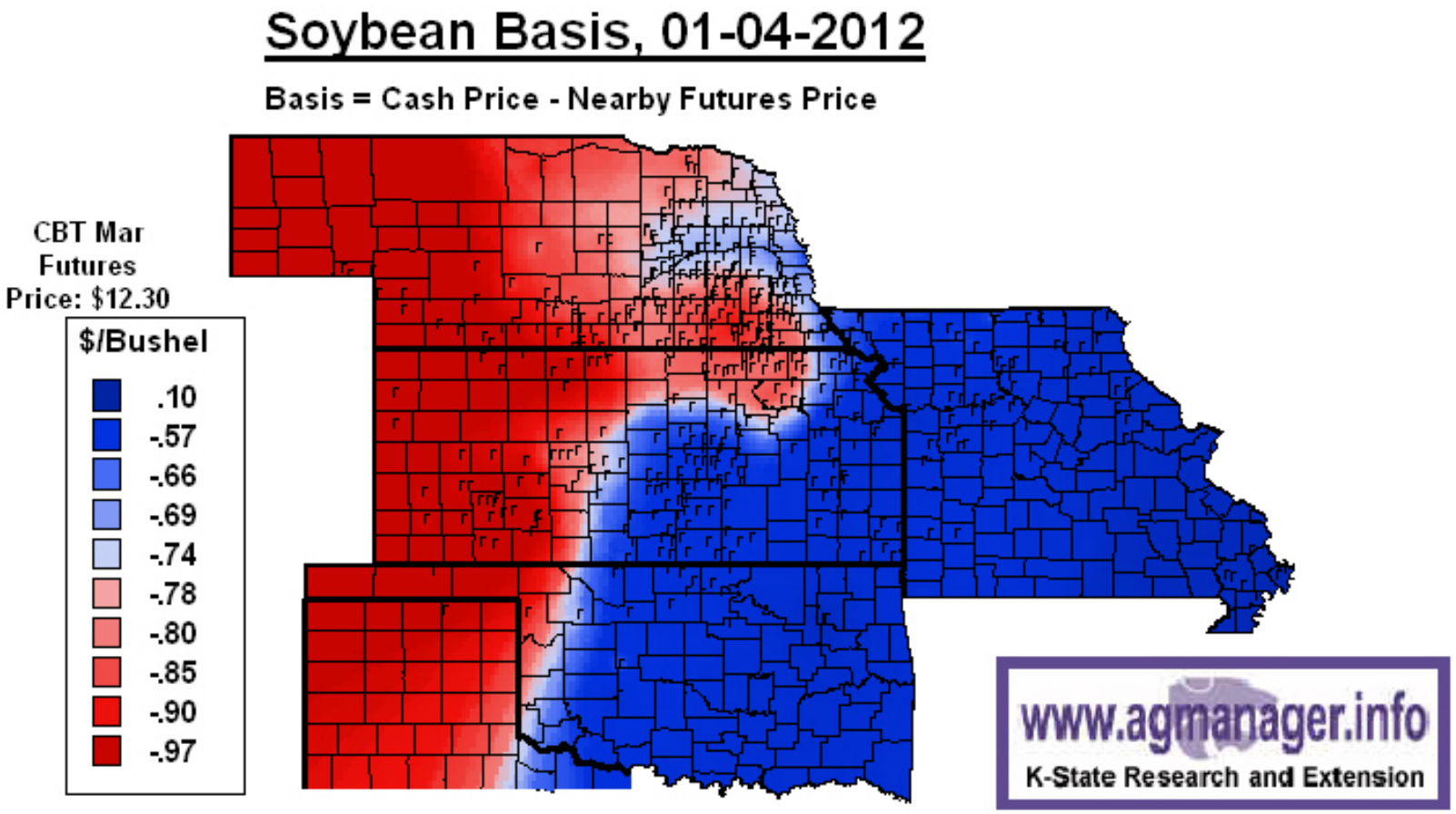
Strongest in southwest KS and weakest in north central and northeast KS.

Basis map on www.AgManager.info



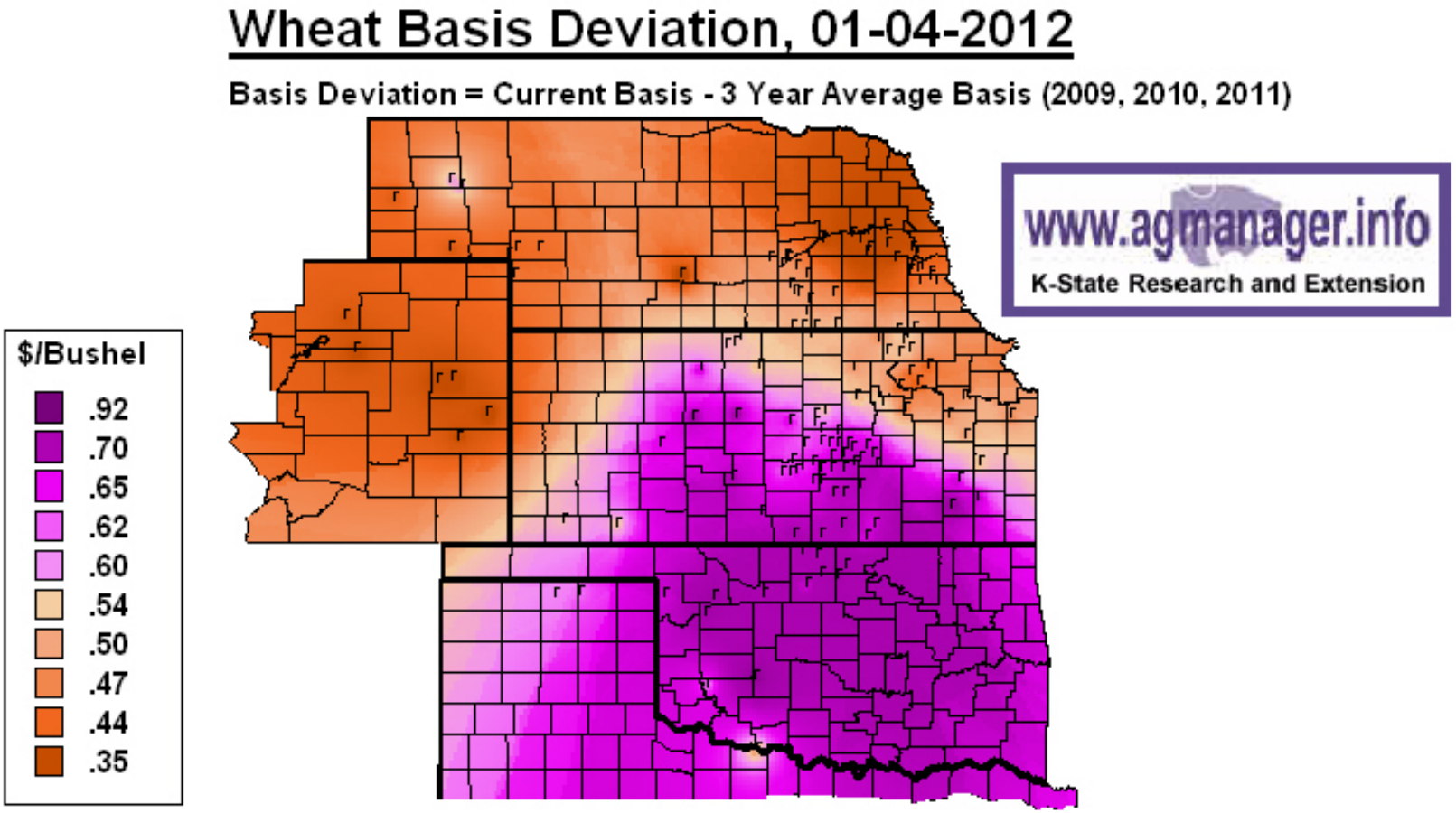
Strongest in central and southeast KS and weakest in western KS.

Basis map on www.AgManager.info



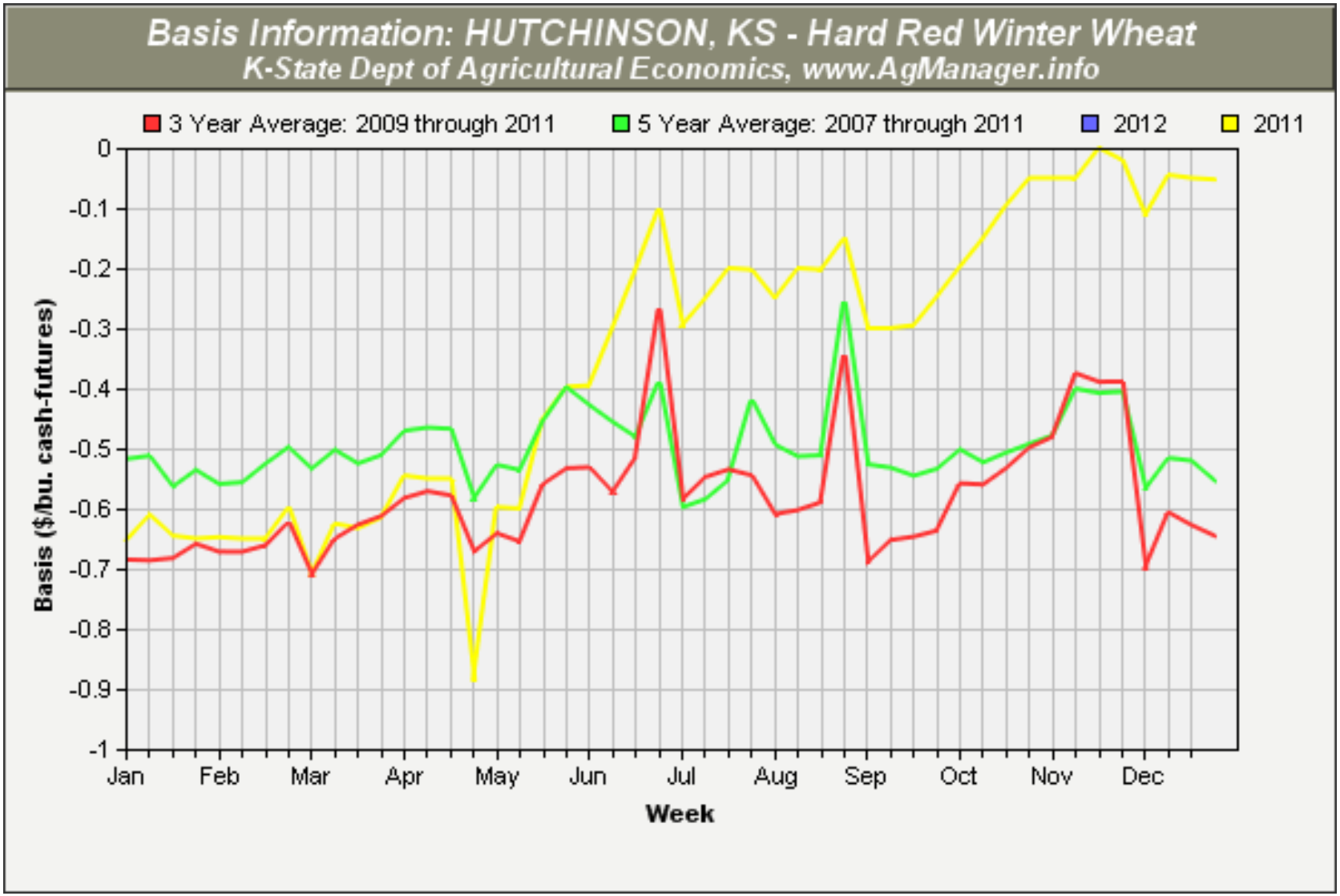
Strongest in eastern KS and weakest in western KS.

Basis deviation map on www.AgManager.info

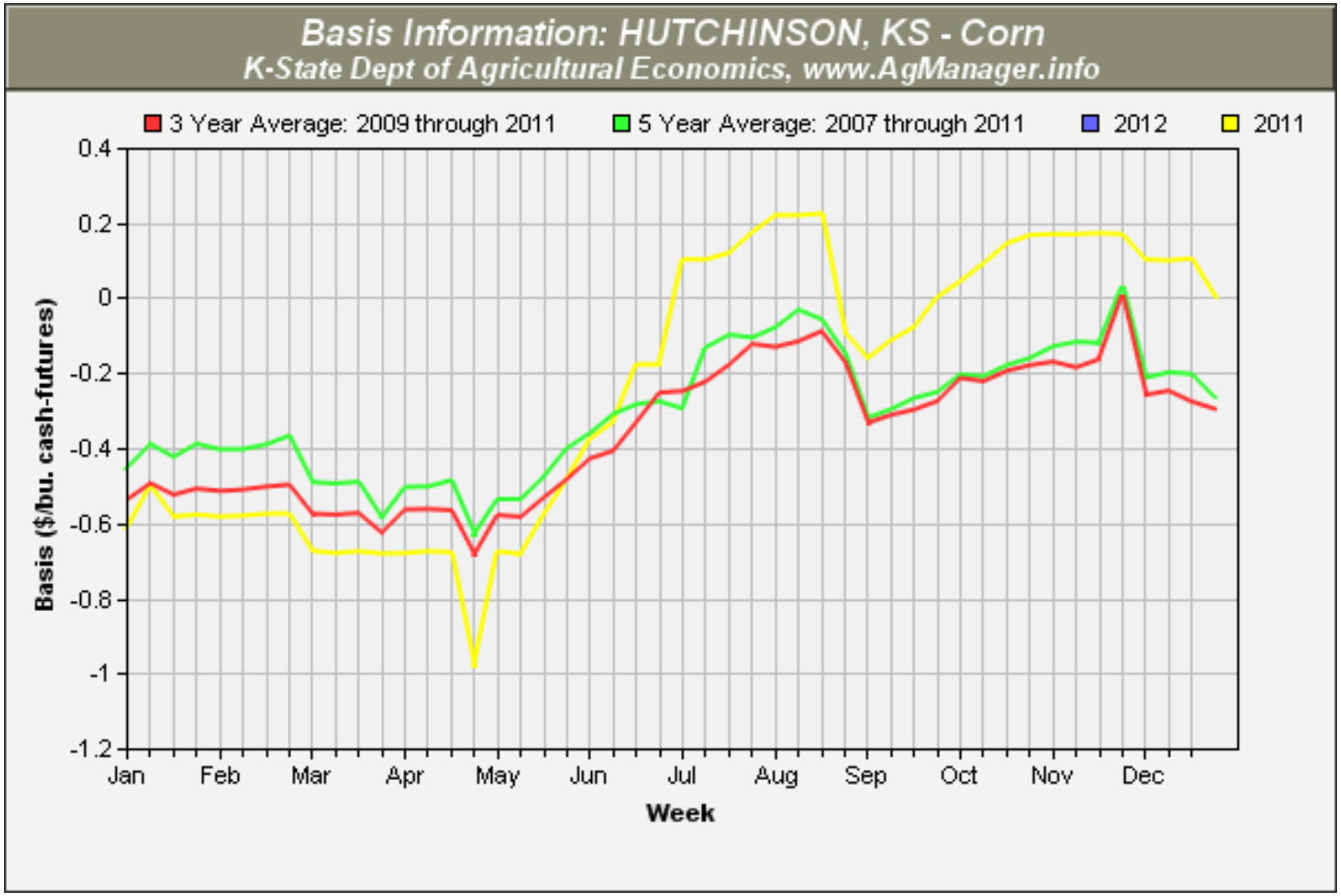


Similar maps for corn, milo, and soybeans

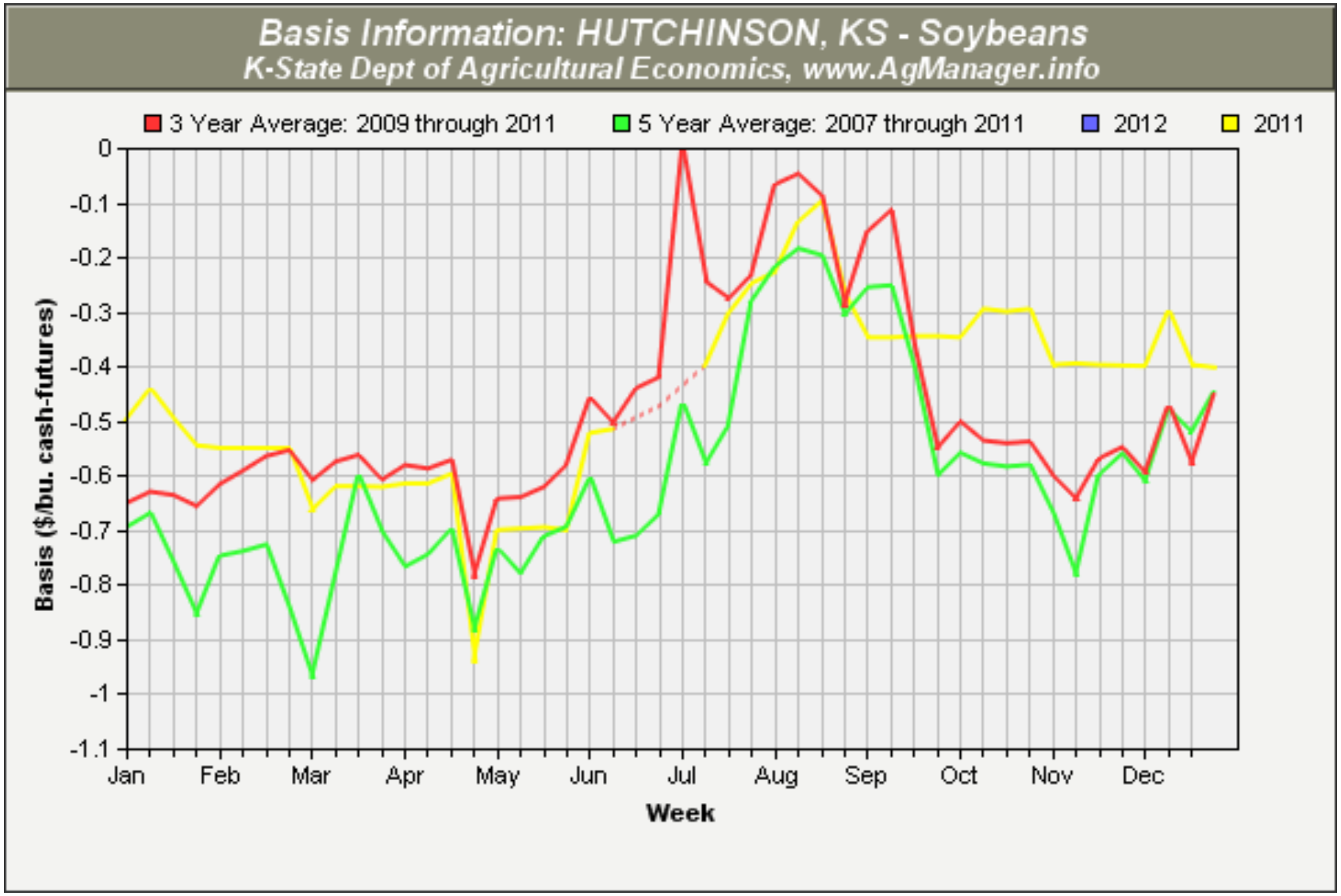
Historical wheat basis…



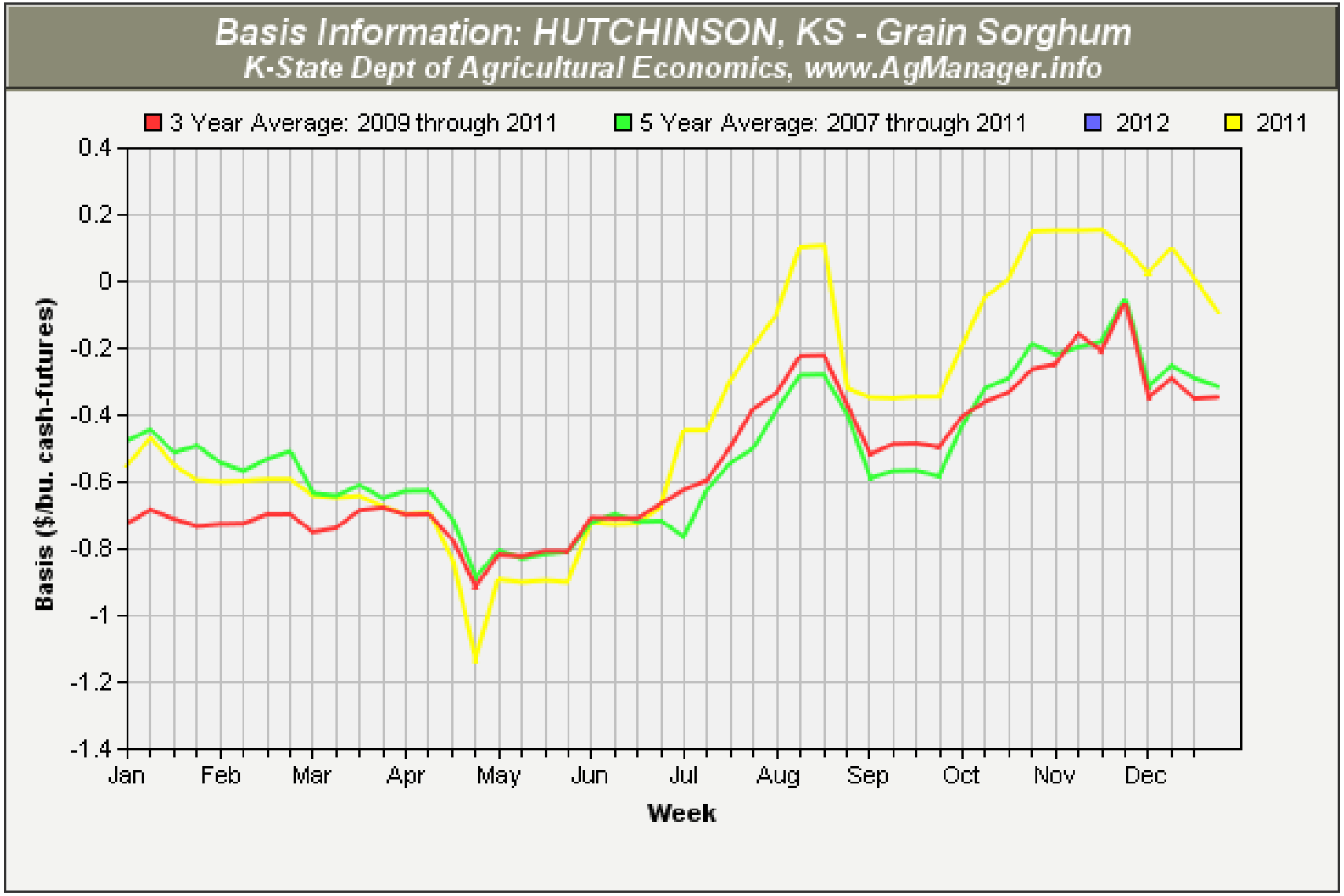
Historical corn basis…



Historical soybean basis…



Historical milo basis…



Objectives of current research

- **Update prior research which was mainly conducted "pre-ethanol"**
- **Compare practical alternatives for forecasting wheat, soybean, corn, and milo basis in Kansas**
  - **Determine number of years to use in multiple-year historical forecasts**
- **Determine if current information improves accuracy of pre- and post-harvest forecasts of crop basis?**
  - **Measured as the deviation in nearby basis from its historical average**
  - **This may capture "structural change" without having to "identify" if/when it is occurring…**

Basis Forecast Model

- **Multiple-year historical forecast model, adjusted for current market information:**

$$\hat{Basis}_{k,j,t,i,h} = \frac{1}{i}\sum_{m=t-i}^{m=t-1} Basis_{k,j,m} + \lambda\left(Basis_{k,j-h,t} - \frac{1}{i}\sum_{m=t-i}^{m=t-1} Basis_{k,j-h,m}\right)$$

k **= location, *j* = time period (harv and harv+24)**

t **= year, *i* = # of years in average, *h* = horizon**

λ **= amount of current information**

Note: *λ* = 0 is simple historical average

λ **= 1 is "fully adjusted" model**

Data & forecasts developed…

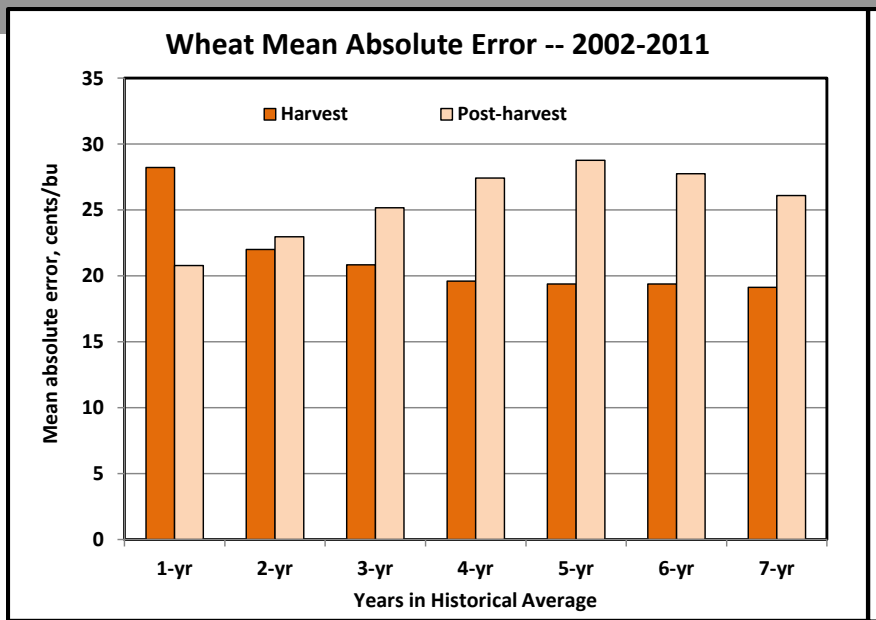
- **Data:**
  - **1982-2011 Wednesday closing prices – currently focusing primarily on last 10 years**
  - **Cash prices from Hutchinson**
    (other locations will be looked at in future)
  - **Adjusted prices to reflect 4-week month**

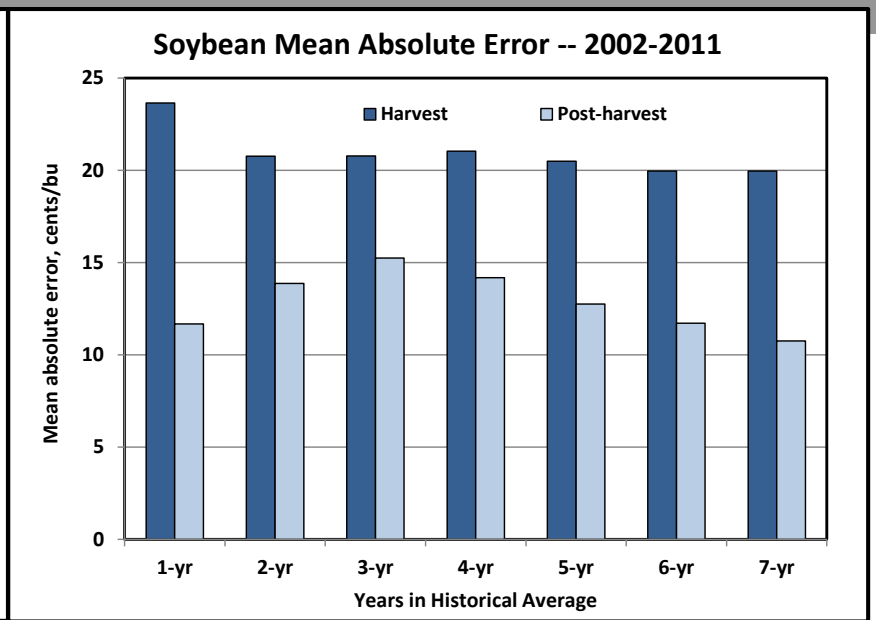
- **Forecasts**
  - **Selected two forecast points: harvest and harvest+24**
  - **Vantage points (weeks prior to forecast period)**
    - **4, 8, 12, 16, 20, and 24 (both harvest & post-harvest)**

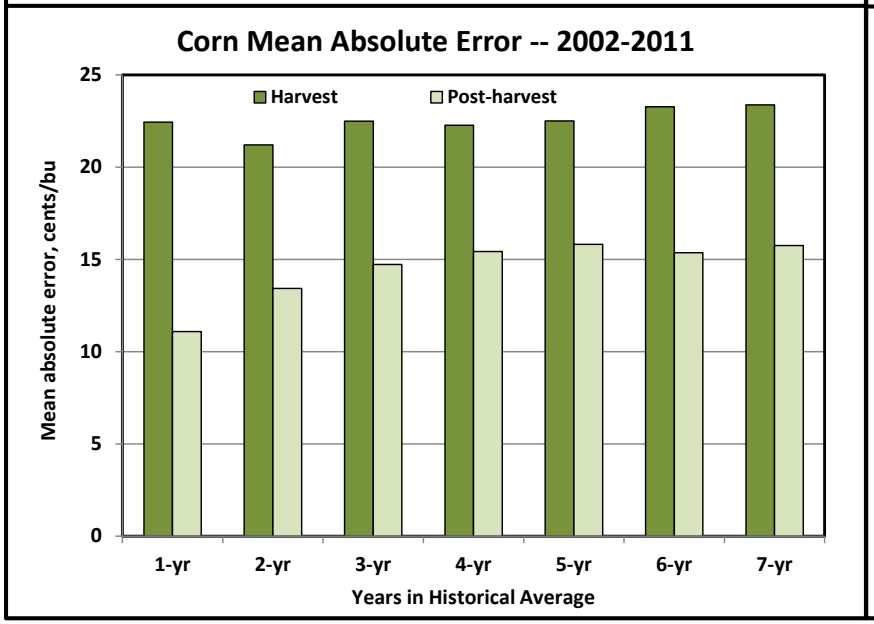
Forecast Evaluation Procedures

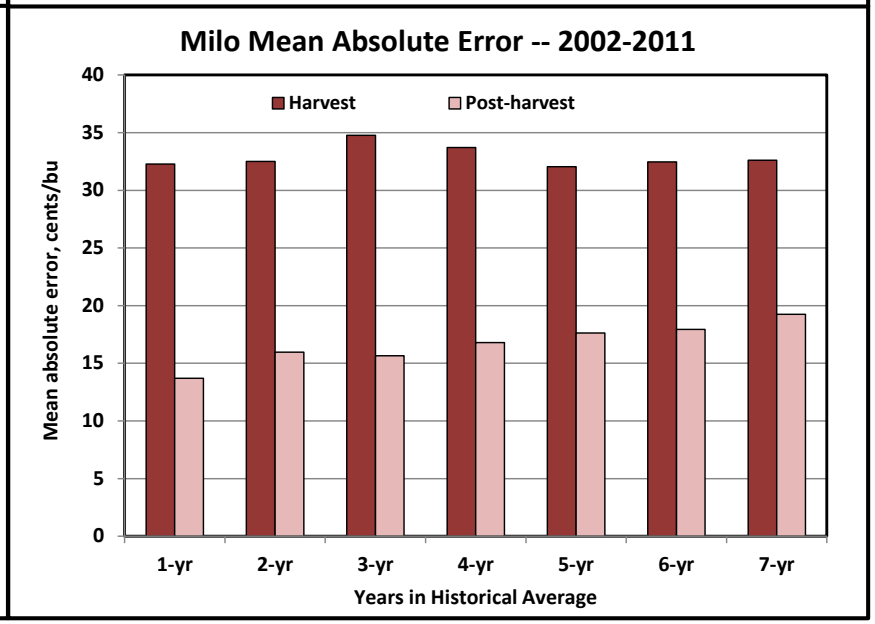
- **Compared different historical models using relative magnitude of MAE's and pairwise t-tests**
- **A single "best" method did not emerge, used subjective consensus to determine number of years to use**
  - **Harvest**
    - **Wheat and soybeans: 7-year average**
    - **Corn and milo: 2-year average**
  - **Post-harvest**
    - **Wheat, corn, and milo: 1-year average**
    - **Soybeans: 7-year average**

Results – Mean absolute forecast error









Results…

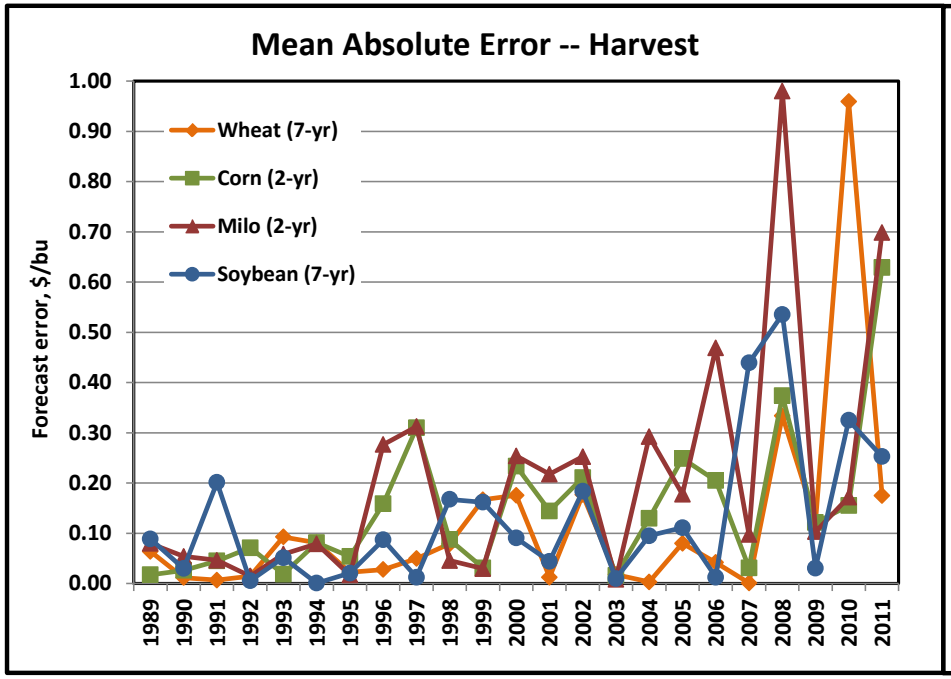
- **Multiple-year historical models:**

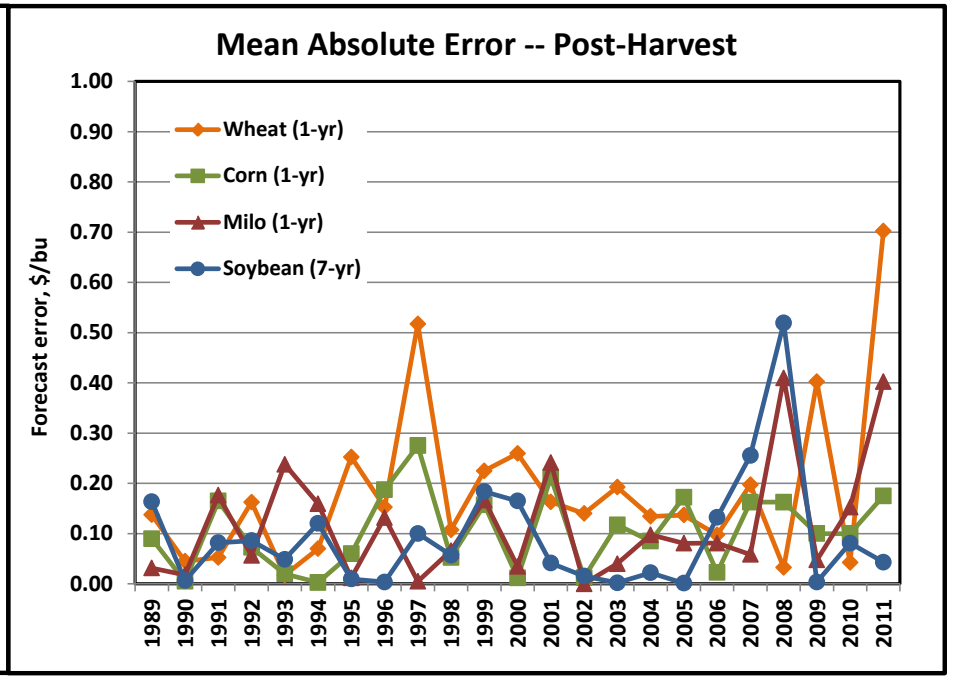
		MAE[1]	
	Model[2]	Harvest	Harvest+24
Wheat	7 / 1-yr	19.1	20.8
Soybeans	7 / 7-yr	20.0	14.2
Corn	2 / 1-yr	21.2	11.1
Milo	2 / 1-yr	32.5	13.7

[1]Cents per bushel

[2]Harvest / Post-harvest years, respectively

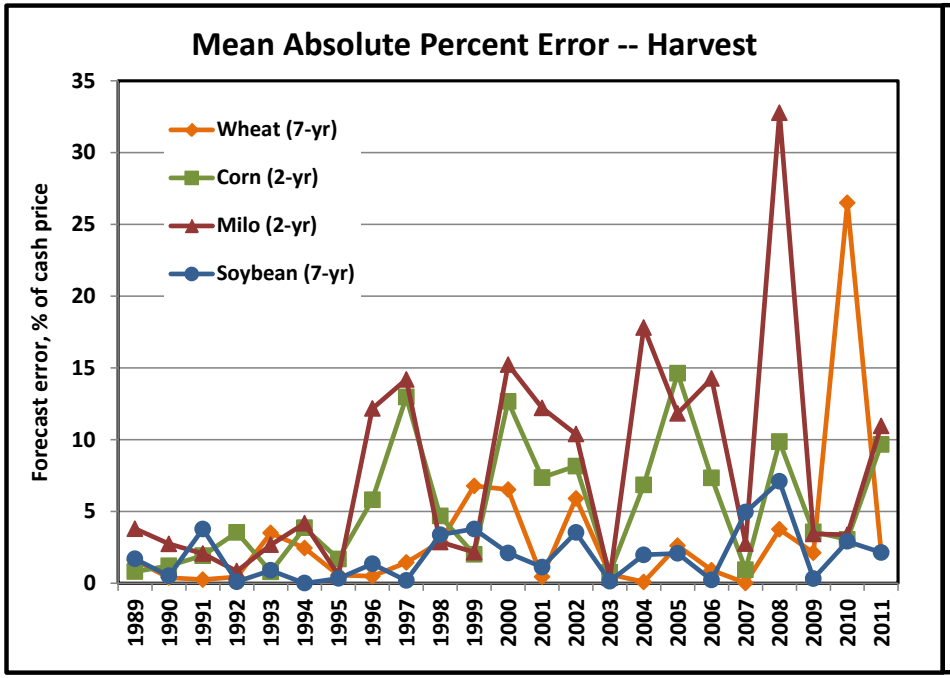
Results – absolute errors over time

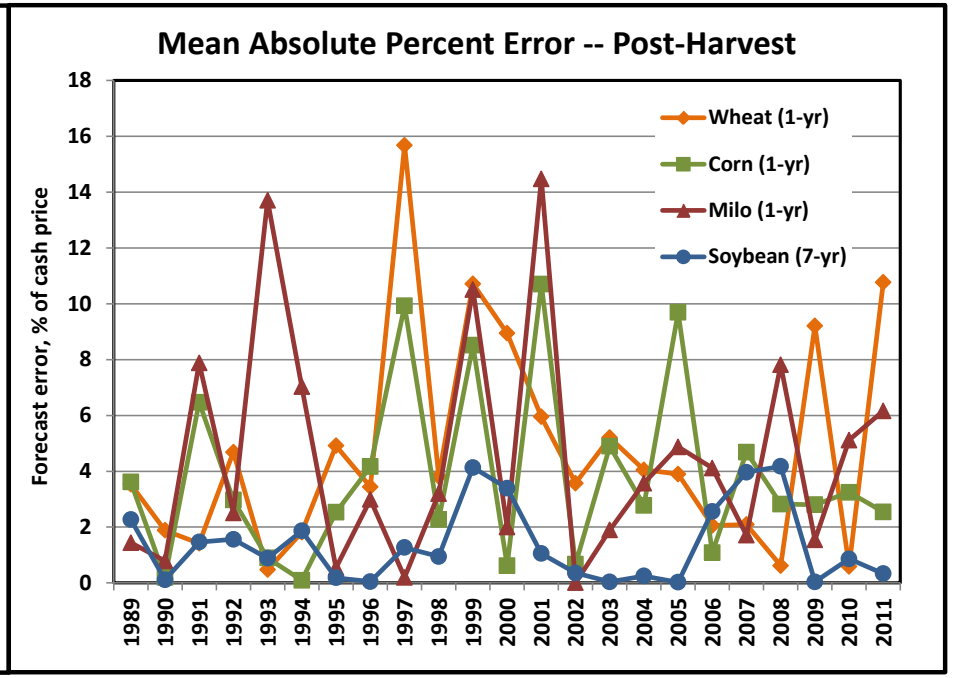




As expected, forecast errors have been increasing in recent years in absolute terms. Historically, post-harvest errors tended to be a little larger, but that hasn't been the case recently…

Results – percent errors over time





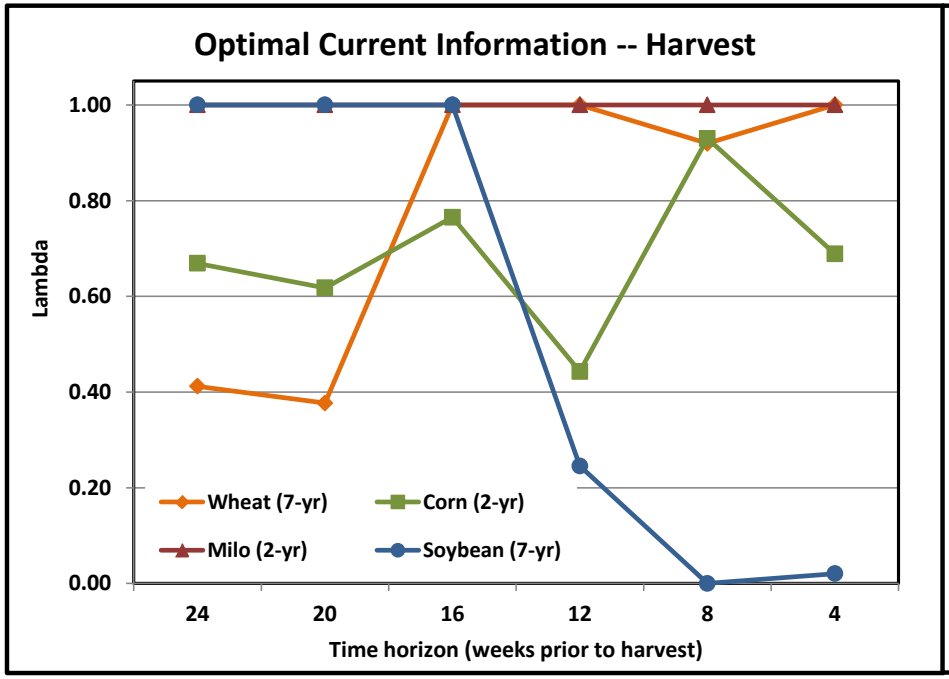
On a percentage basis, post-harvest forecasts errors are no higher today than they were in the past…

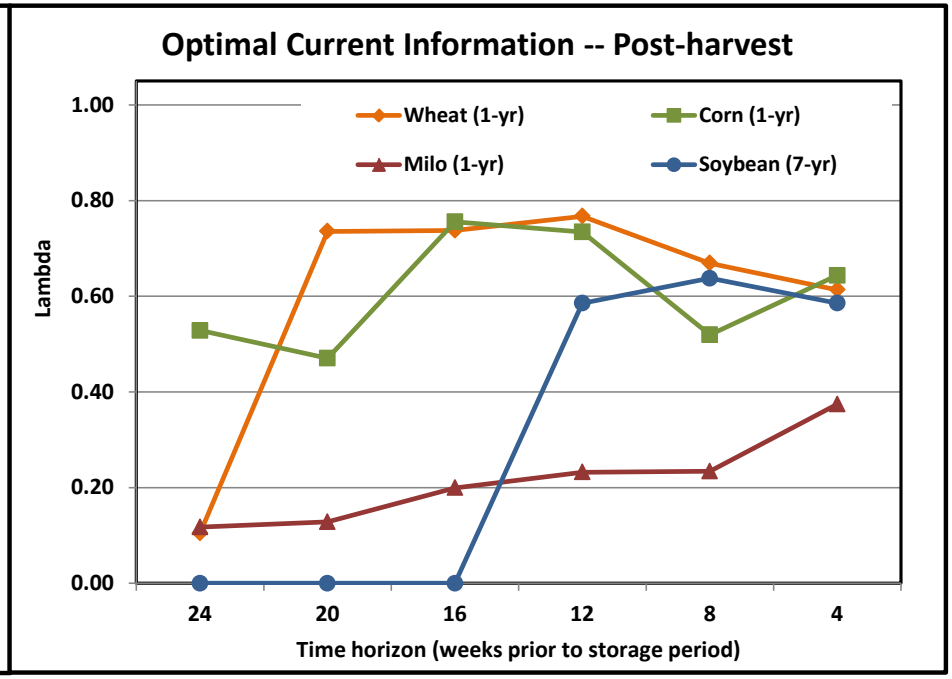
Forecast Evaluation Procedures

- **Current information model:**
  - **Solved for optimal λ by minimizing the MAE associated with the forecast model**
  - **Separate λ selected for each vantage point (not each year – used 2002-11 time period)**
  - **λ was constrained to be between 0 and 1**

- **Included "naïve" models, where forecast of "tomorrow" is equal to "today's value," as another way of incorporating current information**

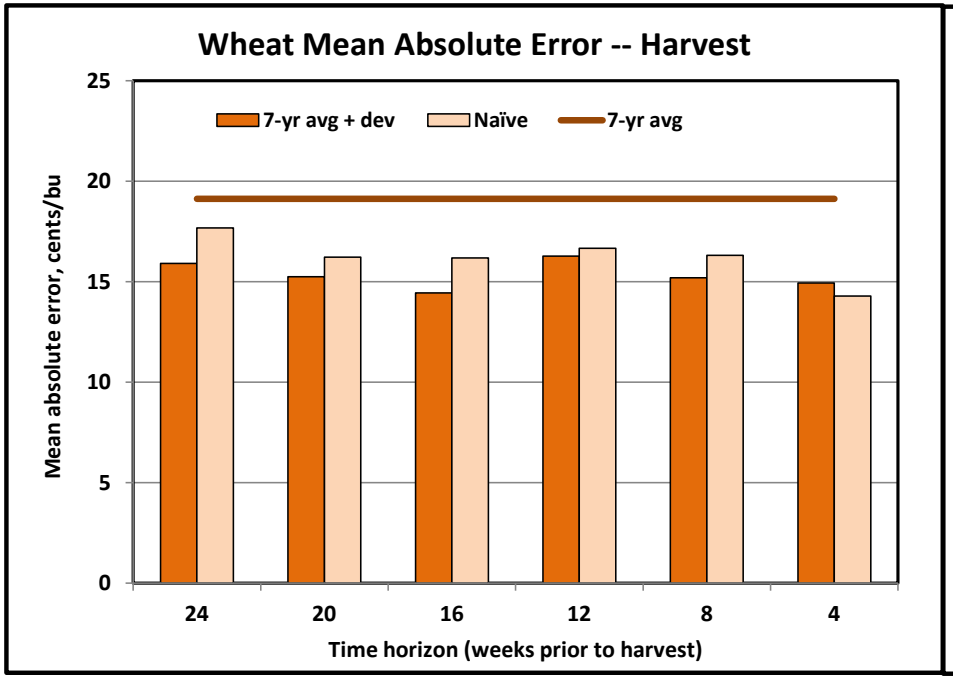
Results – Optimal values for lambda

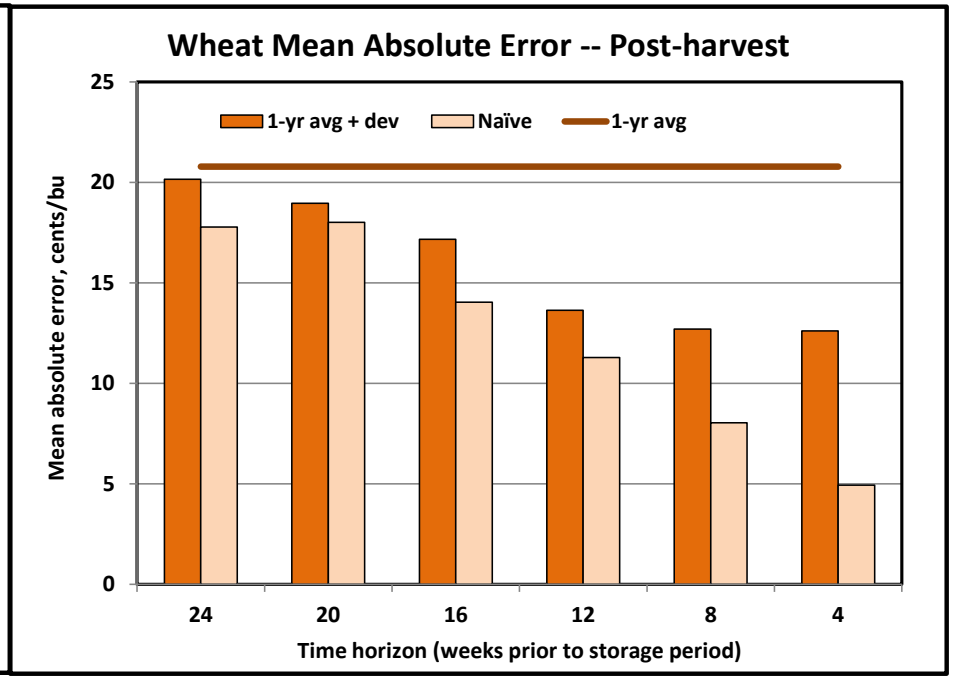




Patterns somewhat as expected for post-harvest, but results for harvest forecasts are less intuitive…

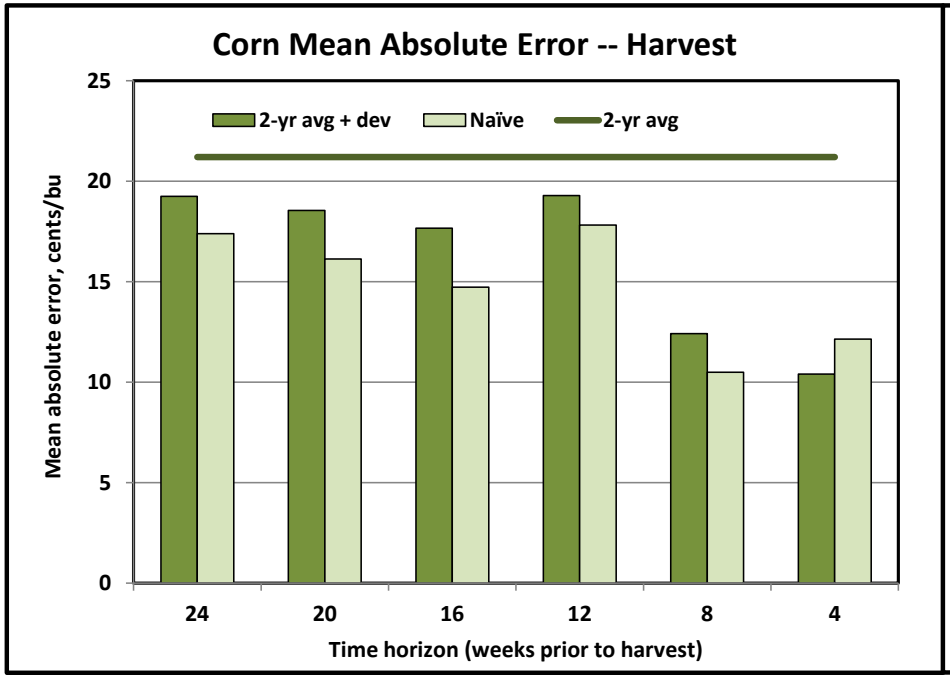
Results -- Basis forecast accuracy for wheat

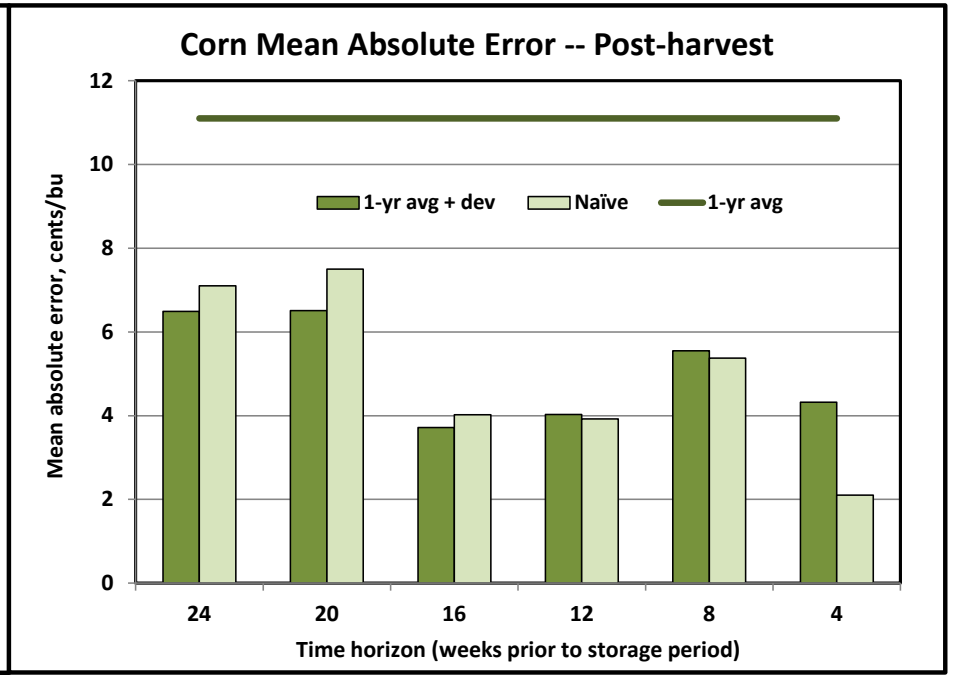




- **Adding current deviations increases forecast accuracy**
  - **about 4 cents/bushel for harvest**
  - **7-8 cents for forecasts 4-12 weeks in advance post harvest**
- **Naïve forecasts**
  - **Similar to slightly worse for harvest**
  - **More accurate post harvest**

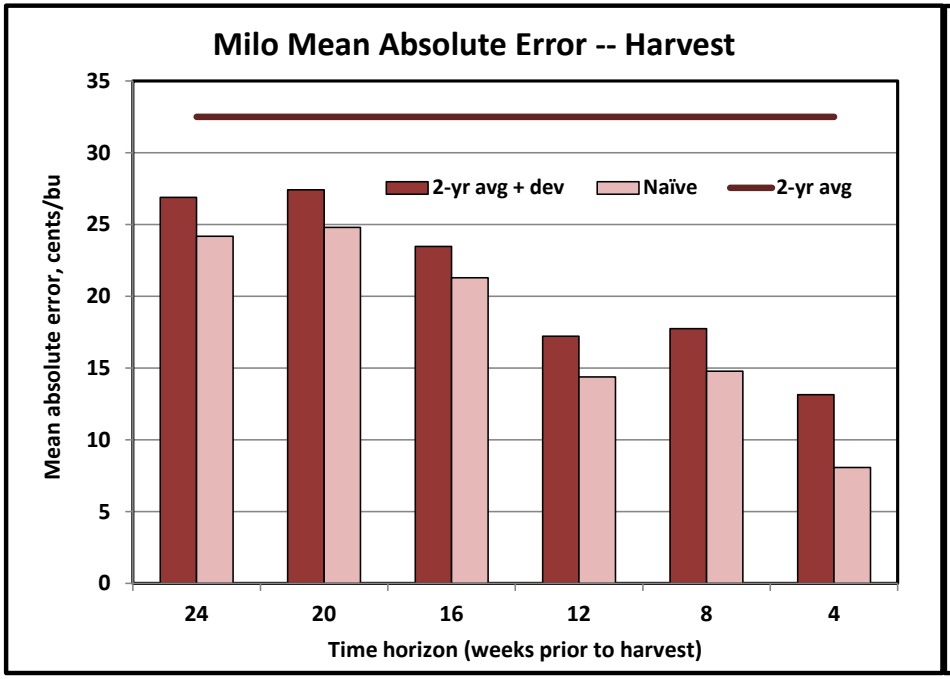
Results -- Basis forecast accuracy for corn

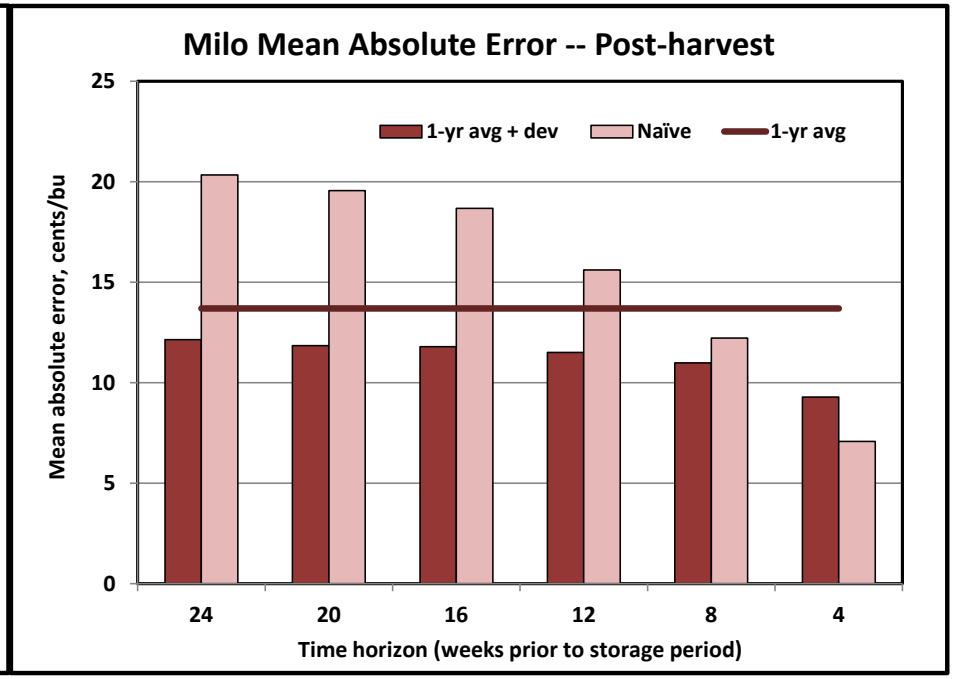




- **Post-harvest forecasts considerably more accurate**
- **Adding current deviations increases forecast accuracy**
  - **about 2-3 cents/bushel 12-24 weeks prior to harvest (10-11 after that)**
  - **5-7 cents for forecasts post harvest**
- **Naïve forecasts**
  - **Similar to slightly better for both harvest and post harvest**

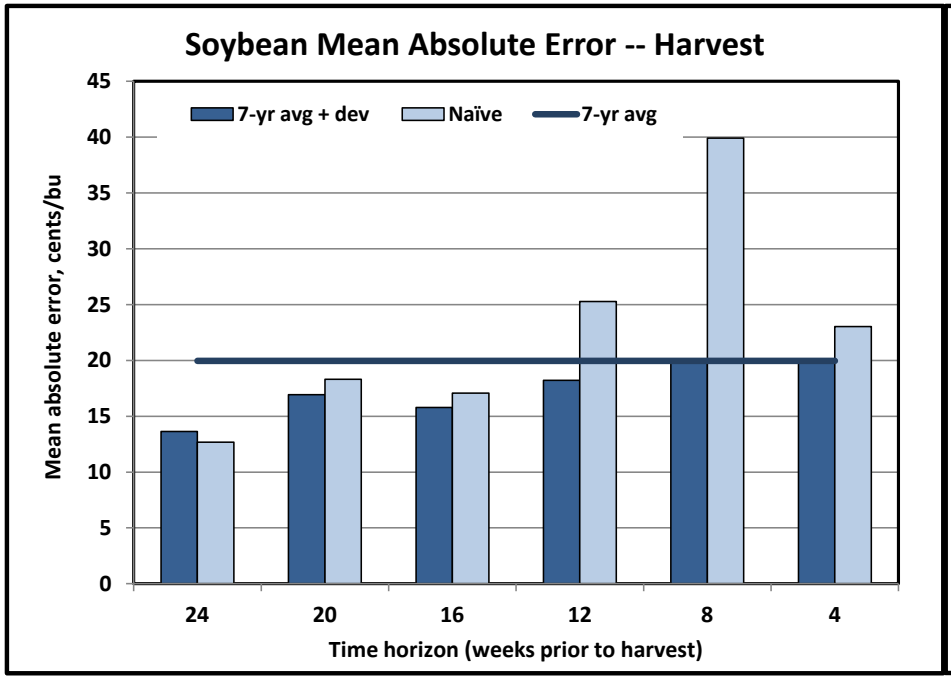
Results -- Basis forecast accuracy for milo

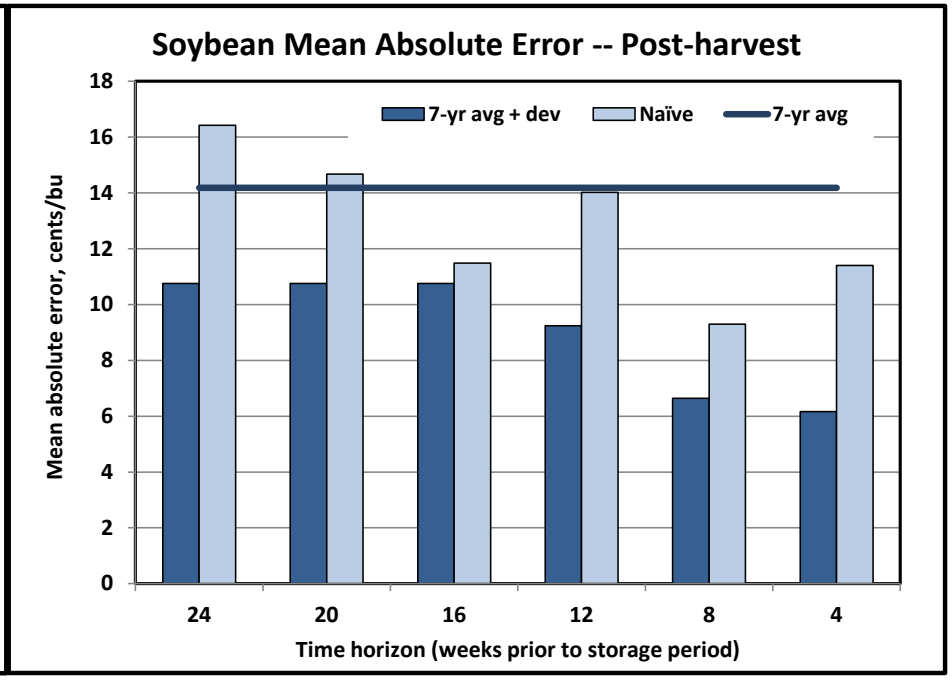




- **Post-harvest forecasts considerably more accurate**
- **Adding current deviations increases forecast accuracy**
  - **about 5-10 cents/bushel 16-24 weeks prior to harvest (15-20 after that)**
  - **1-3 cents for forecasts post harvest**
- **Naïve forecasts**
  - **Similar to slightly better for harvest, but generally worse post harvest**

Results -- Basis forecast accuracy for soybeans





- **Post-harvest forecasts considerably more accurate**
- **Adding current deviations increase forecast accuracy slightly**
  - **Limited value for harvest forecasts (~5 cents/bu 16-24 weeks in advance)**
  - **3-4 cents for forecasts 16-24 weeks in advance post harvest (5-8 after that)**
- **Naïve forecasts very sporadic**
  - **Some cases better than historical average and others worse**

Results…

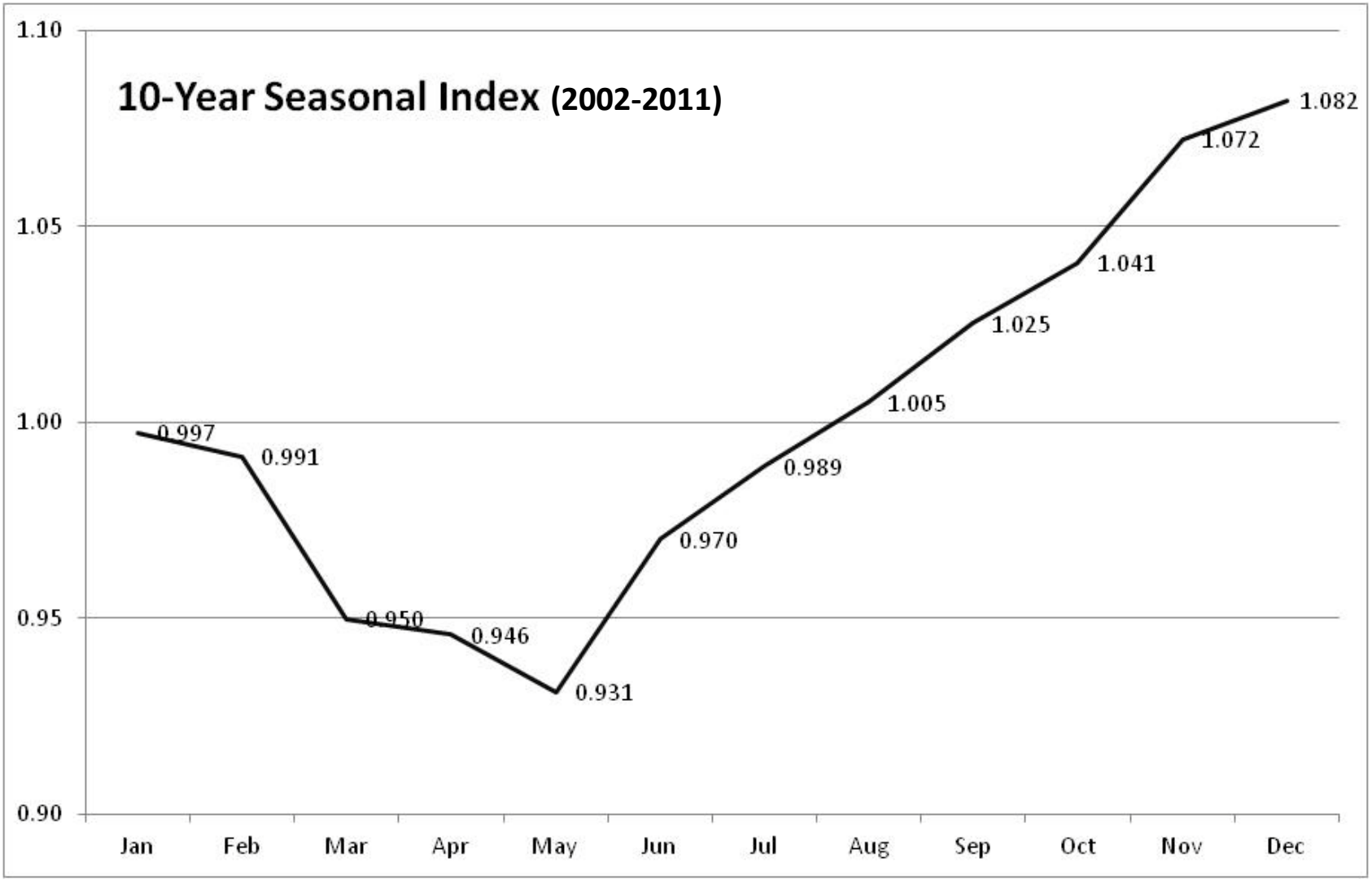
- **Generally, as vantage point approaches forecast date, λ increases**
  - **Current basis is reliable indicator of future basis when "future" is close**
- **For most vantage points, λ = 1 MAE was lower than MAE of λ = 0**
  - **Implies even arbitrary full information improves accuracy over no current information**
- **Naïve forecasts generally perform better than historical average and similar to averages w/dev**

Hay Price Forecasting

- **No futures contract = no "basis"**
  - **Less accuracy in forecasting cash prices directly…**

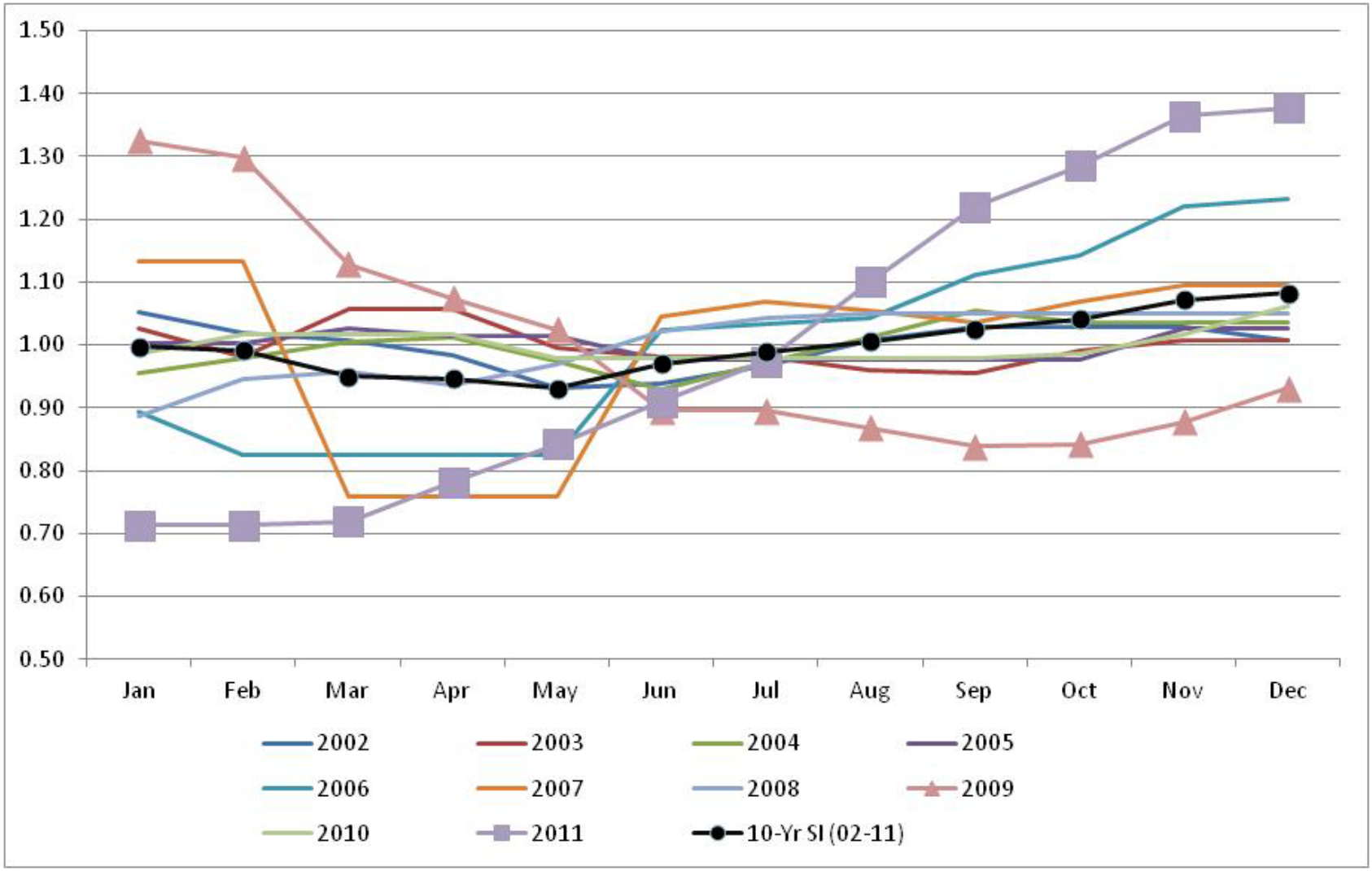
- **Approaches considered:**
  - **Naïve (1 to 12 month horizons)**
  - **10-Yr Seasonal Indices (1 to 12 month horizons)**
  - **Historical averages (1 to 7 years)**
  - **Regression (Nearby Corn Futures Price, Seasonality)**

SW KS Premium Alfalfa Hay



SW KS Premium Alfalfa Hay

Variation of seasonal index for individual years



Hay Price Forecasting - Results

- **Near term forecasts (1 to 5 months):**
  - **Naïve performed best, followed by seasonal index**
- **Longer forecasts (6 to 12 months):**
  - **Use regression informed by Nearby Corn Futures prices**
- **Among historic averages, 1-yr best, but still poor**
  - **Note HA contains the least current information and differences in forecasting basis and cash price…**

Hay Price Forecasting - Results

Summary Table (2007-2011): MAE ($/ton)				
Hist. Avg. - 1 Yr	36.01		*Regression*	23.18
SI - 1	6.35		*Naïve - 1*	5.19
SI - 2	11.57		*Naïve - 2*	9.96
SI - 3	16.35		*Naïve - 3*	14.33
SI - 4	20.01		*Naïve - 4*	18.62
SI - 5	22.72		*Naïve - 5*	22.47
SI - 6	25.02		*Naïve - 6*	25.68
SI - 7	27.41		*Naïve - 7*	28.07
SI - 8	29.90		*Naïve - 8*	30.23
SI - 9	32.09		*Naïve - 9*	32.03
SI - 10	33.65		*Naïve - 10*	33.37
SI - 11	34.67		*Naïve - 11*	34.54
SI - 12	36.01		*Naïve - 12*	36.01

Summary…

- **Cash price forecasts are readily available**
  - **While "accuracy" isn't 100%, the "best available" approach should be utilized …**
- **"Best" forecast varies by crop, pre- vs. post-harvest, etc.**
- **A host of related "free" information is available on AgManager.info**
- **Parallel concept and resources for livestock price forecasts and other agricultural commodities…**

Questions ???

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