Decision Innovation Solutions

ACTUARIAL PERFORMANCE OF CROP INSURANCE

Spencer Parkinson, Decision Innovation Solutions on behalf of Iowa Farm Bureau

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Background

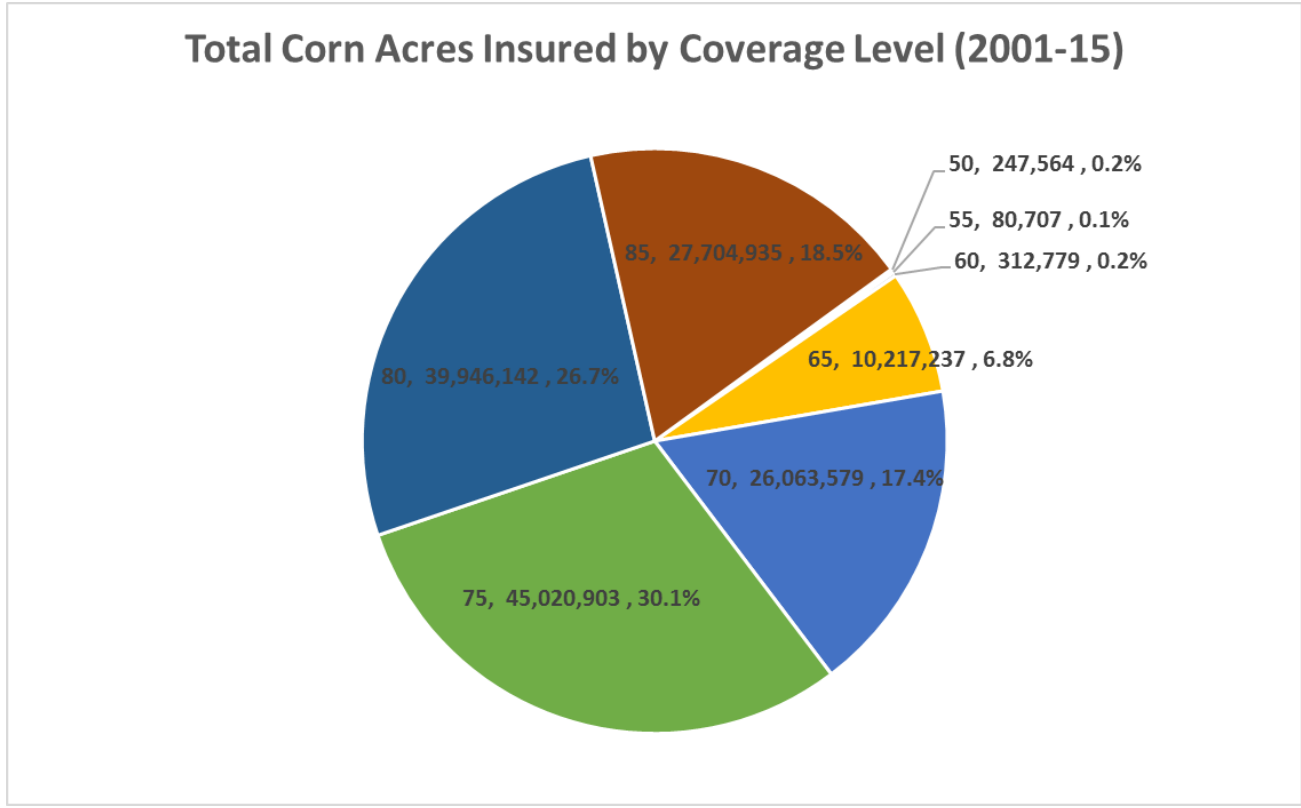
- In January 2017, Carl Zulauf and Gary Schnitkey (Illinois) published an article in Farmdoc Daily dealing with actuarial performance of crop insurance for the nation.
- They found:

Crop	Crop Insurance Loss Ratio
All Crop Acres	0.87
Corn	0.84
Soybeans	0.66
Wheat	0.99
Cotton	1.06

- "Actuarially sufficient" is typically defined as premiums being equal to indemnities, or a loss ratio of 1. But, crop insurance is different:
  - In addition to premium subsidies, crop insurance also has a subsidy built into the loss ratio, meaning that a loss ratio of up to 1.075 is considered sufficient.

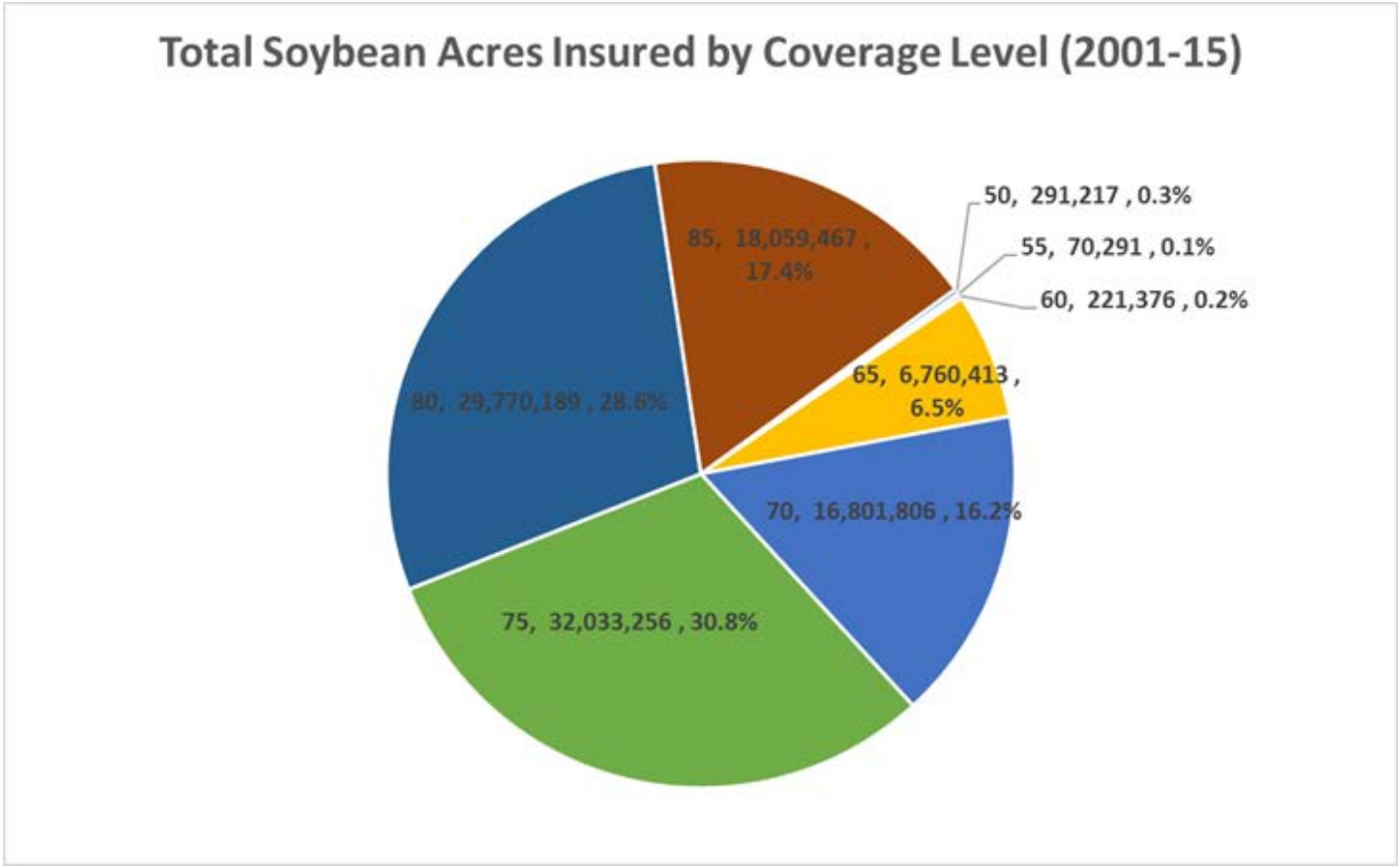
Purchase Patterns, CORN

- Given the national variability in weather, crop insurance purchase patterns (plan, coverage level, etc.), we wanted to know same thing for Iowa
- This and the next chart show the total number of acres insured by crop by coverage level for all revenue-based crop insurance plans
  - Crop Revenue Coverage
  - Revenue Assurance
  - Revenue Protection



Purchase Patterns, SOYBEANS

- While crop insurance is broadly purchased in Iowa, selected coverage levels are quite varied
- The vast majority (~93%) of crop insurance in Iowa is purchased at the 70% coverage level or higher.



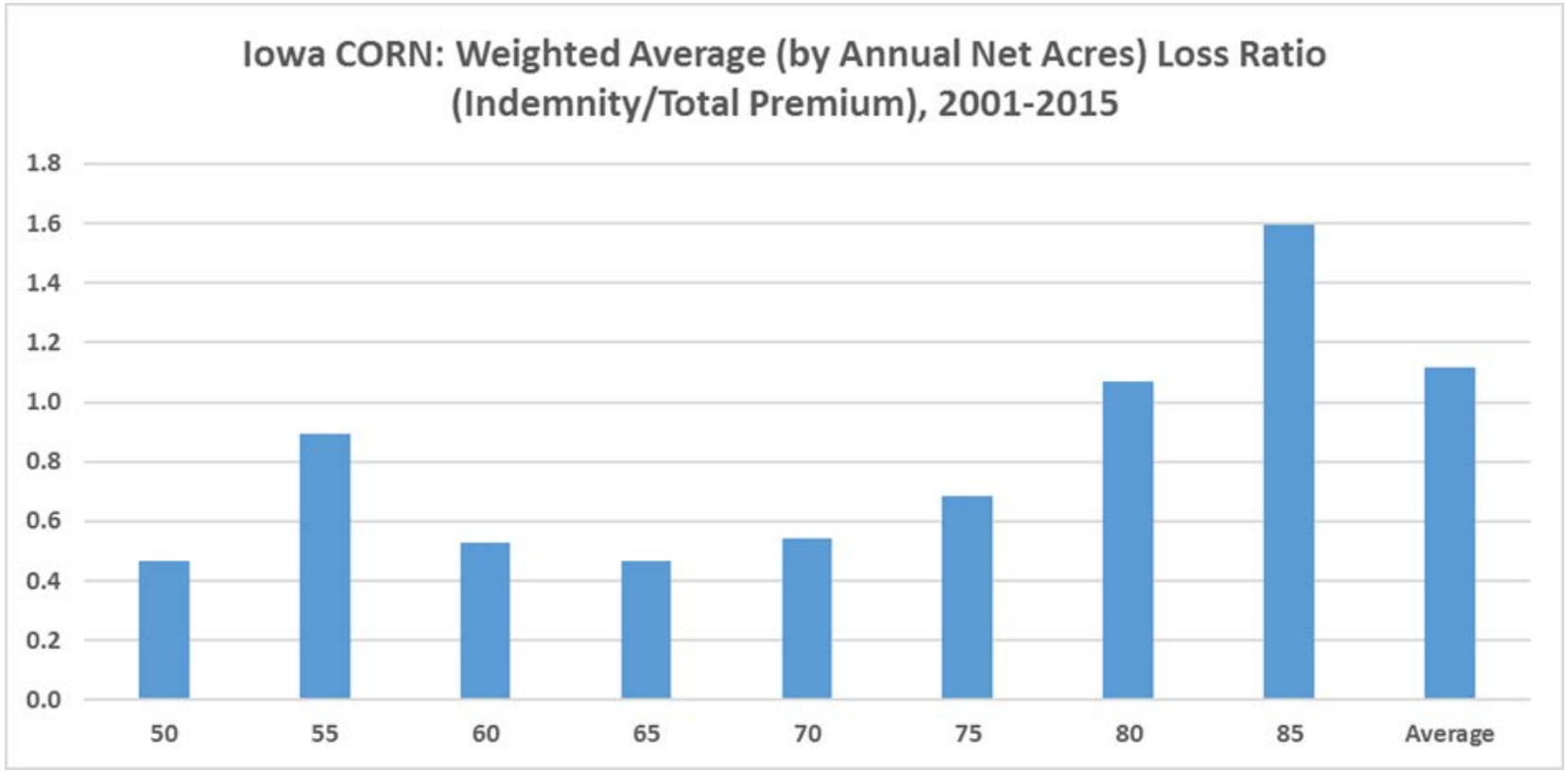
Loss Ratios by Coverage Level, CORN

The following two charts show how crop insurance loss ratios (weighted by "net acres") vary across coverage levels for corn and soybeans for the years 2001-15.

All but the 80% and 85% coverage levels are below the 1.0 loss ratio objective.

High number of acres insured at the 80% and 85% increases the overall average and is slightly above (1.12) the 1.075 loss ratio objective.

The variation in loss ratios by coverage level for corn is quite variable, with the high (85% with 1.60) and low (65% with 0.47), differing by 1.13.

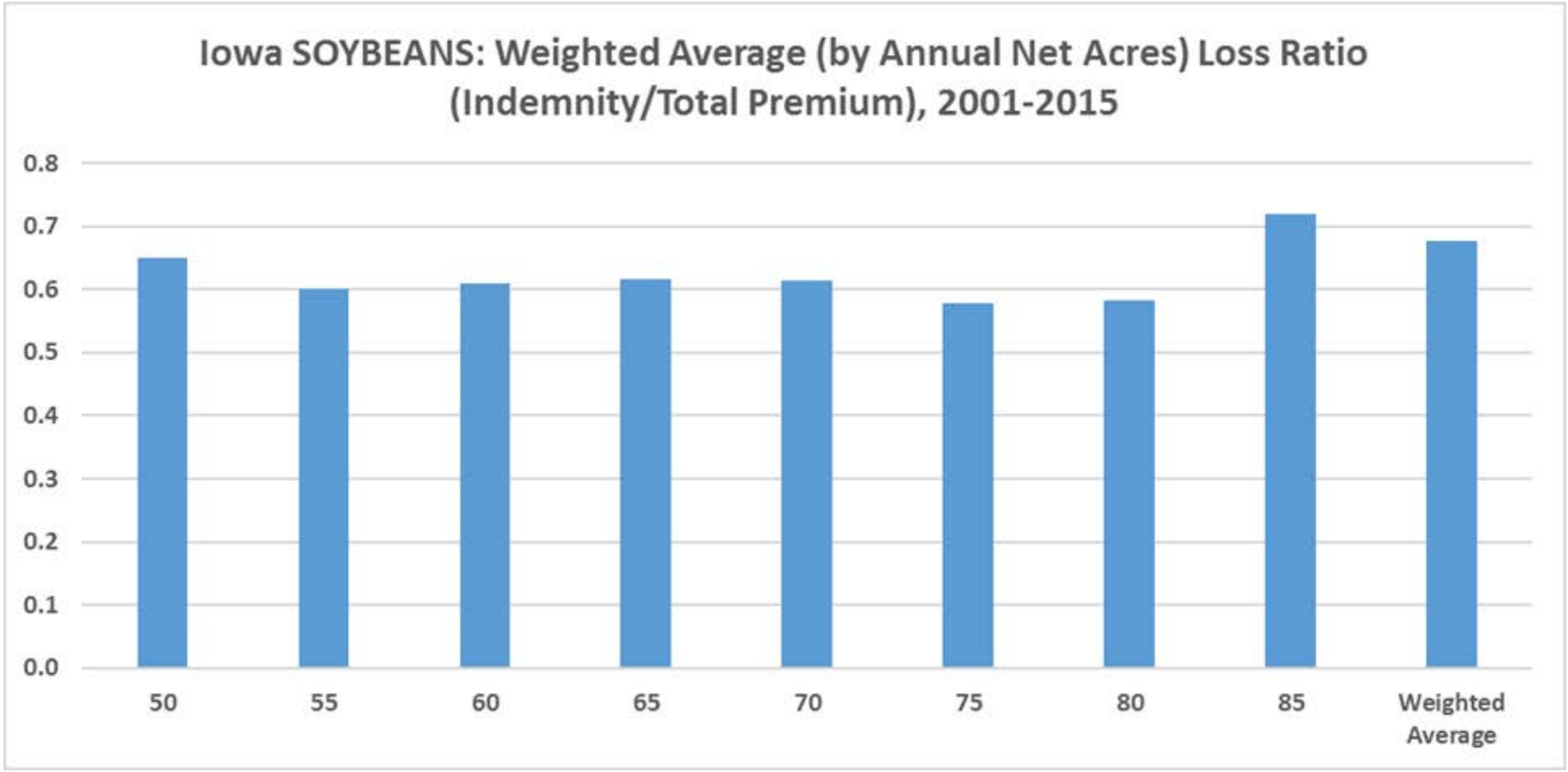


Loss Ratios by Coverage Level, SOYBEANS

All coverage levels for soybeans are below the 1.0 loss ratio objective.

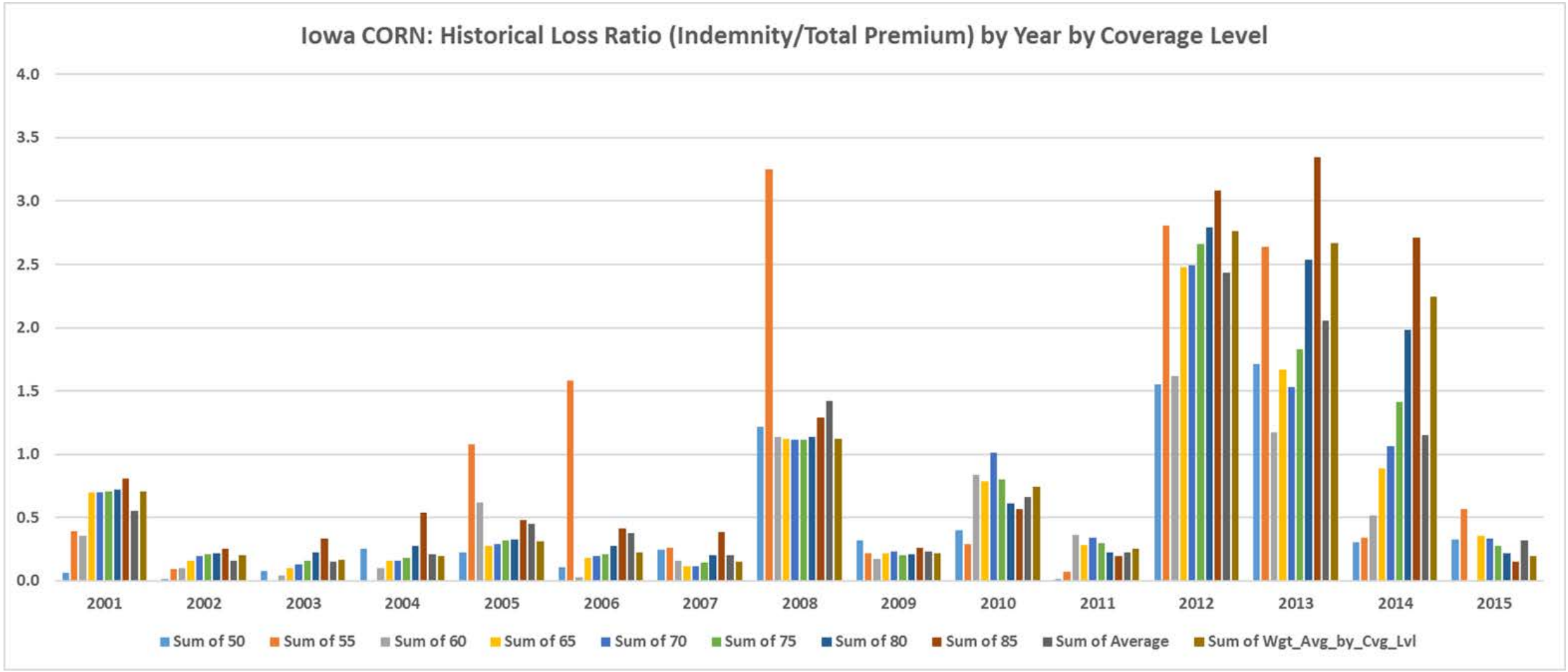
The overall average is well below (0.68) the 1.075 loss ratio objective.

The variation in loss ratios by coverage level for soybeans are much more uniform, with the high (85% with 0.72) and low (75% with 0.58), only differing by 0.16.



Loss Ratios by Year, CORN

The following two charts show how crop insurance loss ratios vary across year by coverage level. The two data points in the far right of each year are 1) a simple average of all coverage levels' loss ratios and 2) a weighted average (by number of net acres in each coverage level for a given year). As shown in Figure 5 and Figure 6, the following can be observed:



Loss Ratios by Year, SOYBEANS

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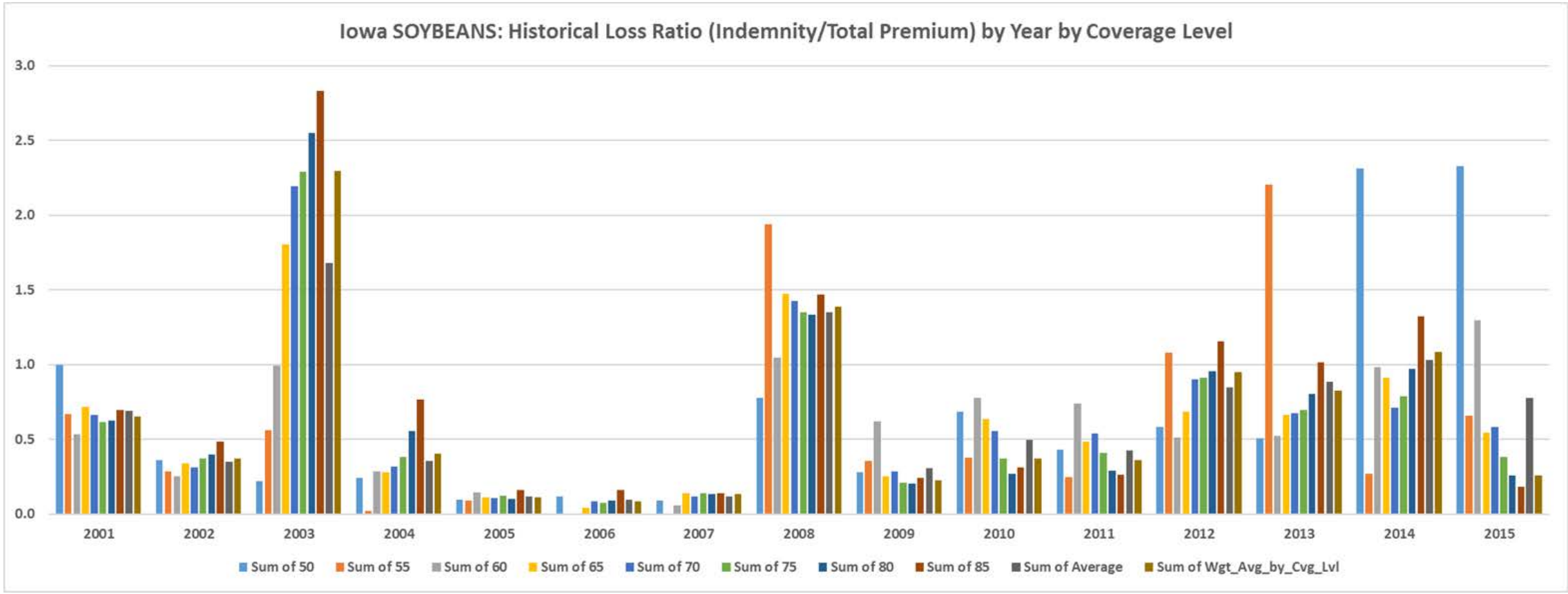

Loss Ratios by Year, Summary

The following can be observed from the two prior slides:

- For **corn**, four years (2008 and 2012-14) are the primary reason for the longer-term loss ratio exceeding the loss ratio objective.
- For **corn**, almost without exception, all coverage levels for these four years exceeded the 1.0 threshold.
- For **corn**, almost without exception, the loss ratio for the 85% coverage level is the highest of all coverage levels for all years. This suggests that the 85% coverage level is underrated.
- For **soybeans**, 2003 and 2008 were the years most attributed for increasing the loss ratio.
- Despite 2012 being a drought year, the loss ratio for soybeans (0.95) was much lower than for corn (2.76). This is primarily due to the soybean yield deviating less (as a percent) from trend than it did for corn in 2012

Iowa Loss Ratios Video

- Iowa (Corn and Soybeans): https://www.youtube.com/watch?v=uI6mePLUQjI

Additional Analysis at National Level

- Using same insurance plans and time period as in the Iowa analysis, loss ratios are studied for the following crops:
  - Corn
  - Soybeans
  - Wheat
  - Cotton

- U.S. (Corn, Soybeans, Wheat and Cotton)
  - https://www.youtube.com/watch?v=304A74ktduA

Additional Analysis at National Level

- Using ALL insurance plans, ALL crops and SAME time period as in the prior Iowa and National analysis, loss ratios are studied
- National ALL Crops, ALL Plans: https://www.youtube.com/watch?v=BKZs9vbJIM4&feature=youtu.be

Conclusions

- Crop insurance performs differently, particularly due to:
  - Geography
  - Plan
  - Coverage level
  - Covered Crop
- A few years in particular (2002 and 2012) have pulled weighted average loss ratios higher
- Overall (all crops, all plans) loss ratios are less than the actuarially sufficient goal of 1.075.

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Thanks!

Spencer Parkinson

Decision Innovation Solutions

Urbandale, IA

spence@decision-innovation.com

www.decision-innovation.com