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Identifying Areas to Reduce Uncertainty and the WASDE Database

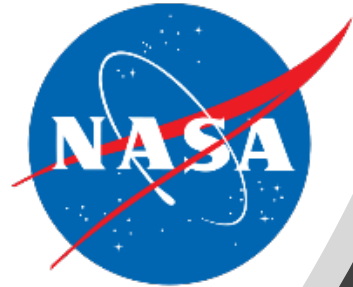
Seth Meyer and Joe Glauber

Selected Paper prepared for presentation at the International Agricultural Trade Research Consortium's (IATRC's) 2019 Annual Meeting: Recent Advances in Applied General Equilibrium Modeling: Relevance and Application to Agricultural Trade Analysis, December 8-10, 2019, Washington, DC.

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Identifying Areas to Reduce Uncertainty and the WASDE database

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December 9, 2019

Some of the US Government's Principal Federal Economic Indicators (PFEIs), some with 'lockup'

- World Agricultural Supply and Demand Estimates (WASDE) + Crop Production-
USDA
- Crop Production - USDA
- Housing Starts - Dept. of Commerce
- Gross Domestic Product - Dept. of Commerce
- Employment – Dept. of Labor

NOTE: This report adopts U.S. area, yield, and production forecasts for winter wheat, durum, other spring wheat, barley, and oats released today by the National Agricultural Statistics Service (NASS). For rice, corn, sorghum, soybeans, and cotton, area estimates reflect the June 30 NASS Acreage report, and methods used to project production are noted on each table. The first survey-based 2014 production forecasts for those crops will be reported by NASS on August 12.

WHEAT: Projected U.S. wheat supplies for 2014/15 are raised this month with a sharp increase in forecast Hard Red Spring (HRS) wheat more than offsetting a decrease for Hard Red Winter (HRW). The HRW crop was damaged by drought and April freezes in the Southern and Central plains; however, the HRS crop in the Northern Plains has benefitted from abundant soil moisture and cooler than normal early summer temperatures. Yields for Durum and other spring wheat are forecast to be above average. Feed and residual use for all wheat in 2014/15 is lowered 15 million bushels to 145 million as tight supplies of HRW wheat and relatively more attractive prices for feed grains reduce expected feed and residual use. All wheat exports for 2014/15 are lowered 25 million bushels reflecting expectations of large world supplies and strong competition in export markets. Ending stocks are projected 86 million bushels higher. The projected season-average farm price range is lowered 40 cents at the midpoint to \$6.00 to \$7.20 per bushel.



United States Department of Agriculture
National Agricultural Statistics Service



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Crop Production 2014 Summary

January 2015



WASDE and Crop Production and are market movers



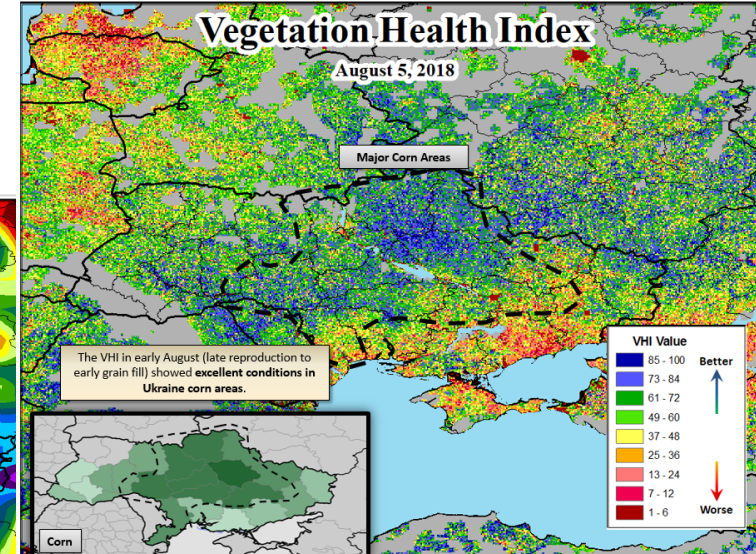
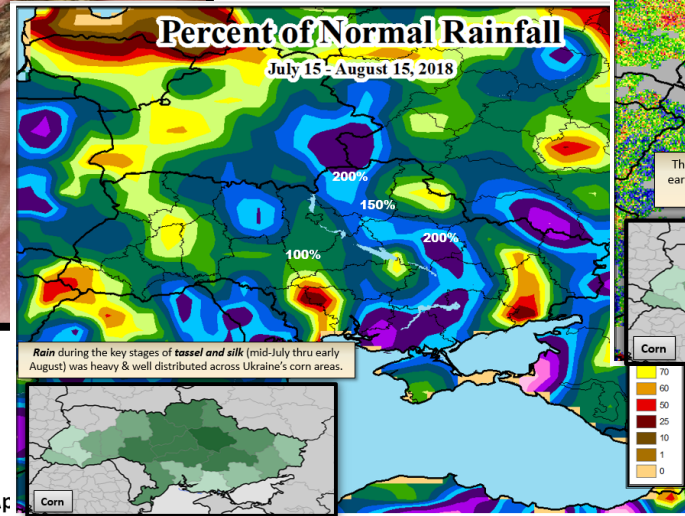
Interagency Commodity Estimates Committee (ICEC) WASDE Process

Fungus on Wheat in France; August 8-9

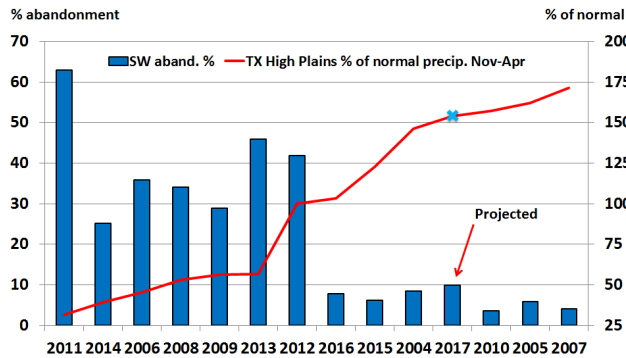


USDA Foreign Agricultural Service
Office of Global Analysis
IPA Division

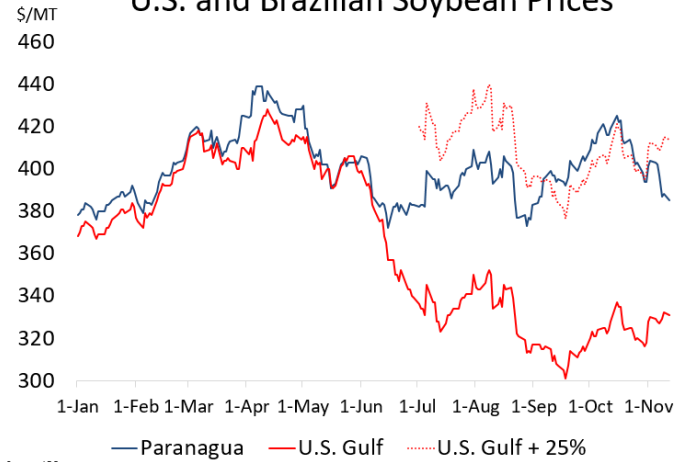
Ukraine Corn



Southwest Season Abandonment Rates and TX High Plains % of Normal Rainfall Nov-Apr (arrayed by rainfall)

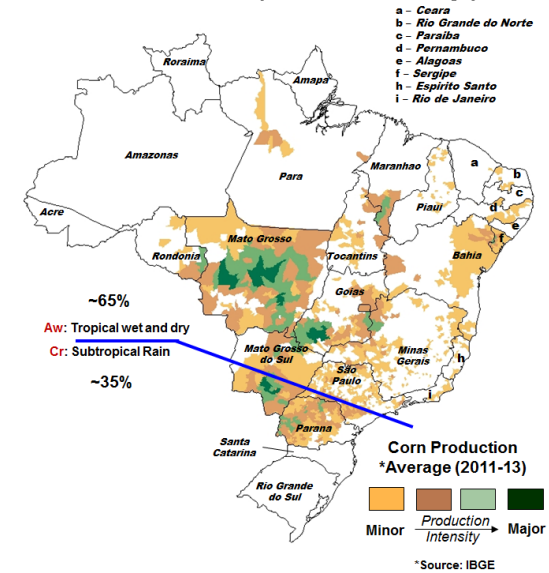


U.S. and Brazilian Soybean Prices



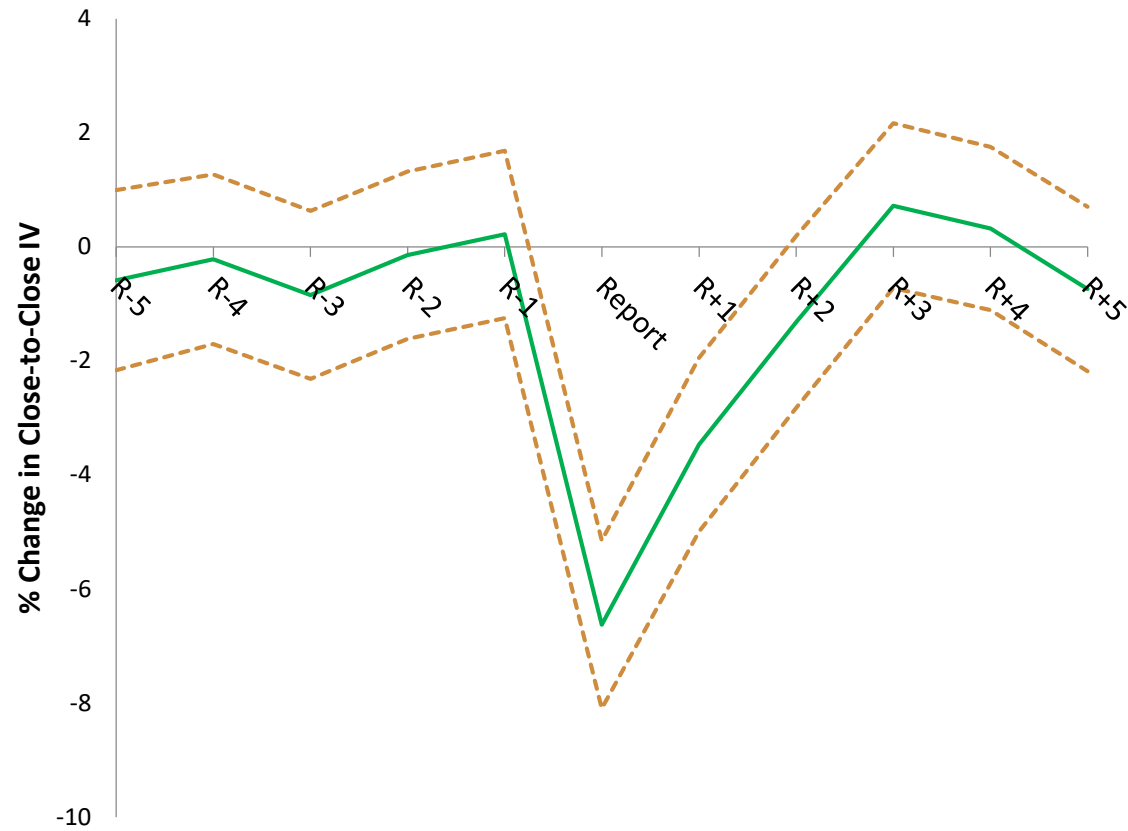
Source: IGC

Brazil Corn (Second Crop)

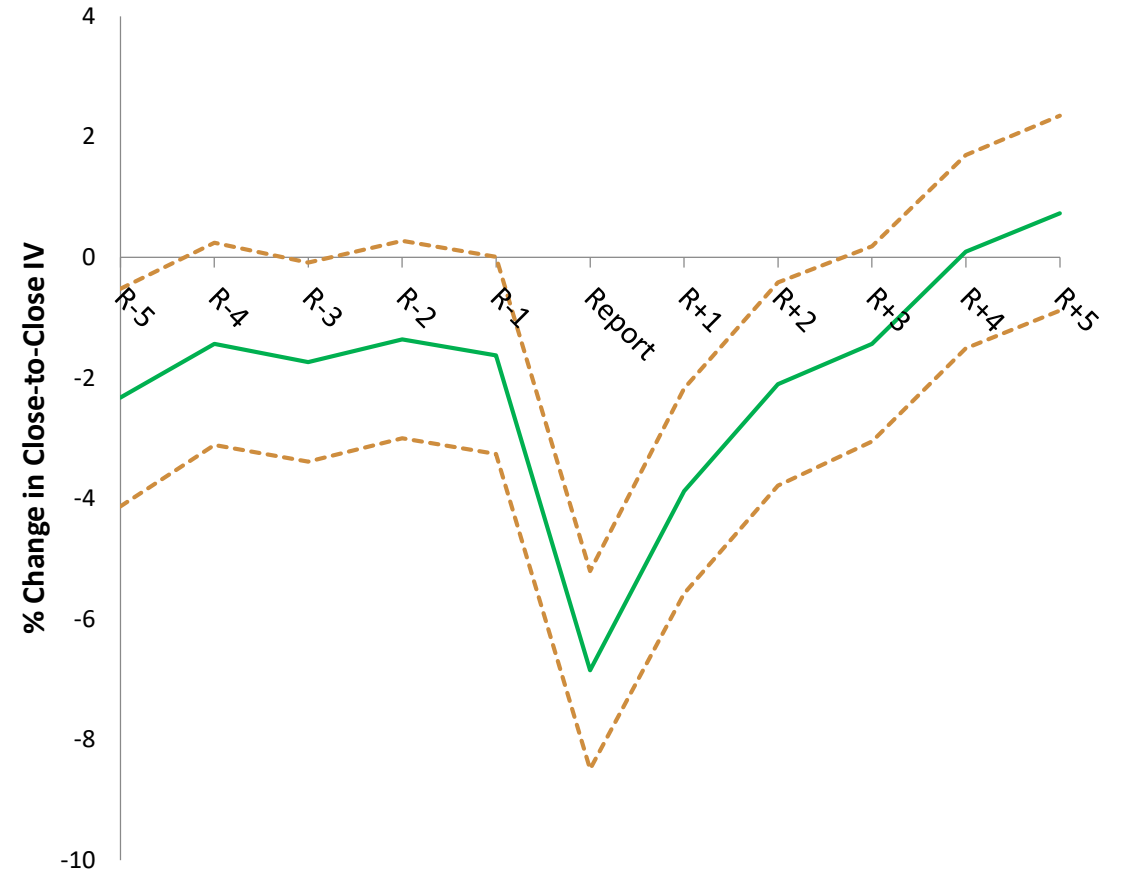


*Source: IBGE

Impact of USDA report releases on implied volatility



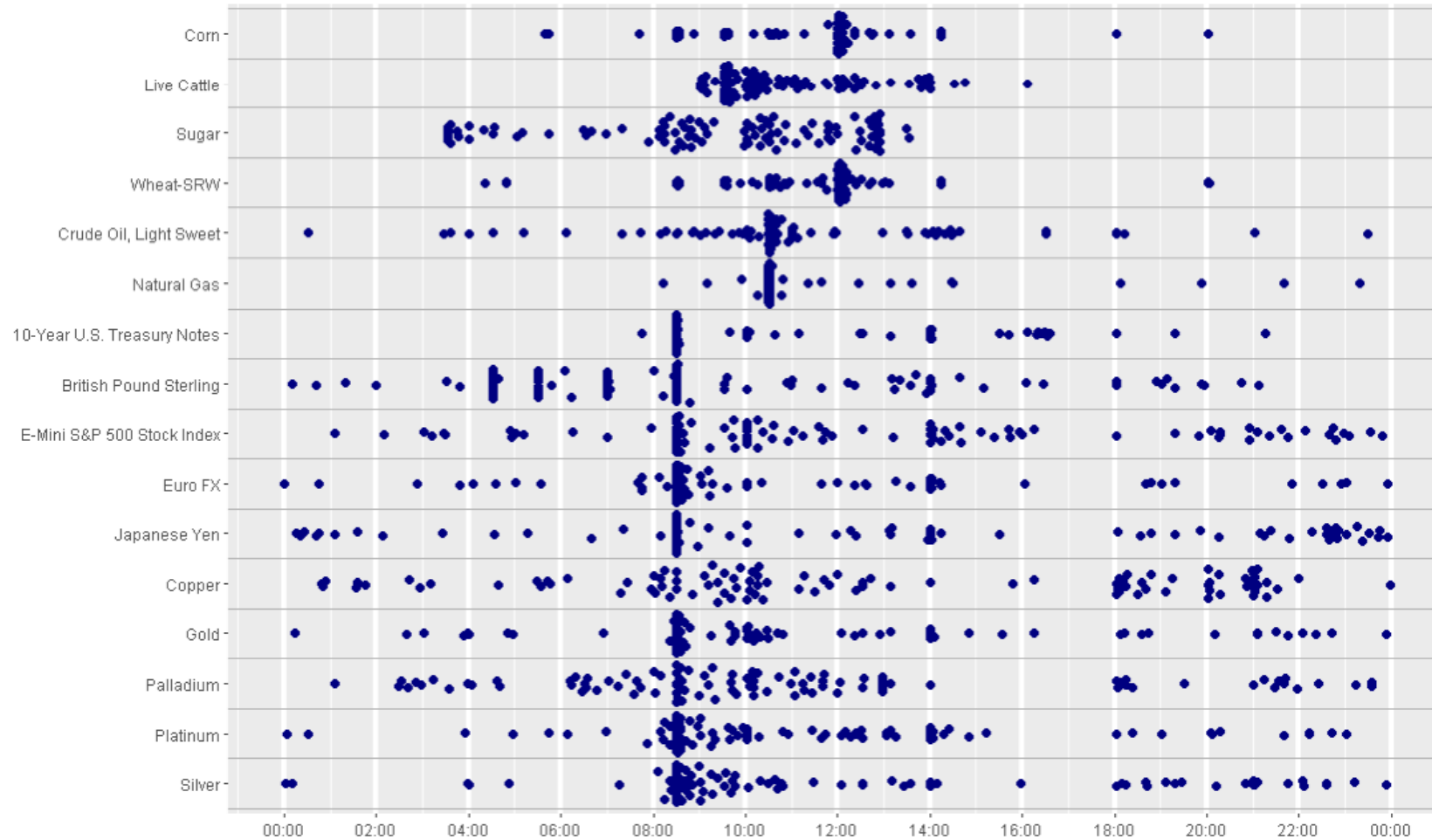
CBOT Corn



CBOT Soybeans

Peak Movements by Commodity

Exhibit 5: Top 100 Price Movements and Time of Occurrence by Contract



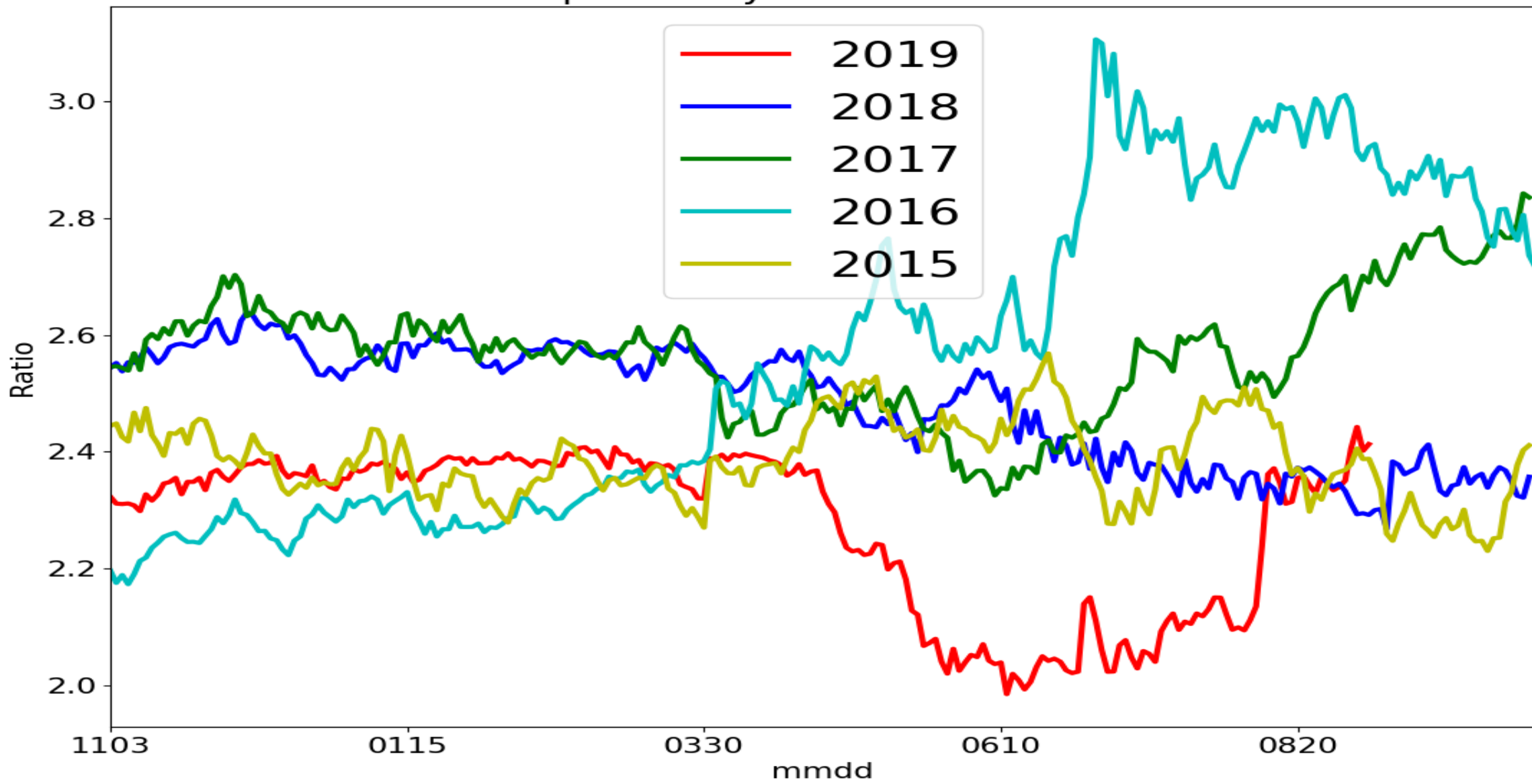
Source: CFTC

Kewanee Illinois



Source: Hannah Kerner, University of Maryland, <https://www.planet.com/stories/kewanee-vujj8zbZg>

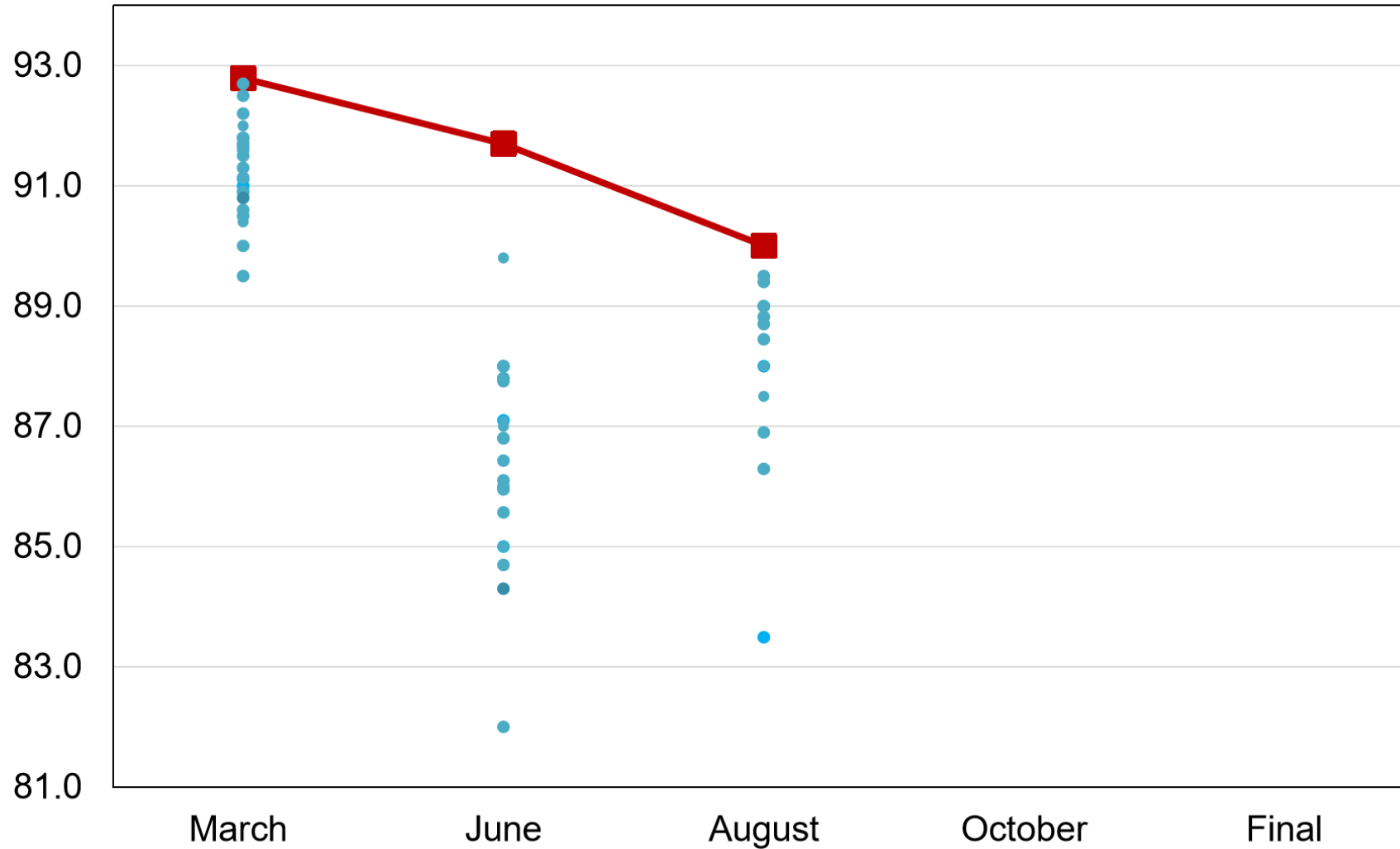
New Crop U.S. Soybean to Corn Price Ratio





2019 United States Corn Acres Industry Expectations vs NASS

Million Acres

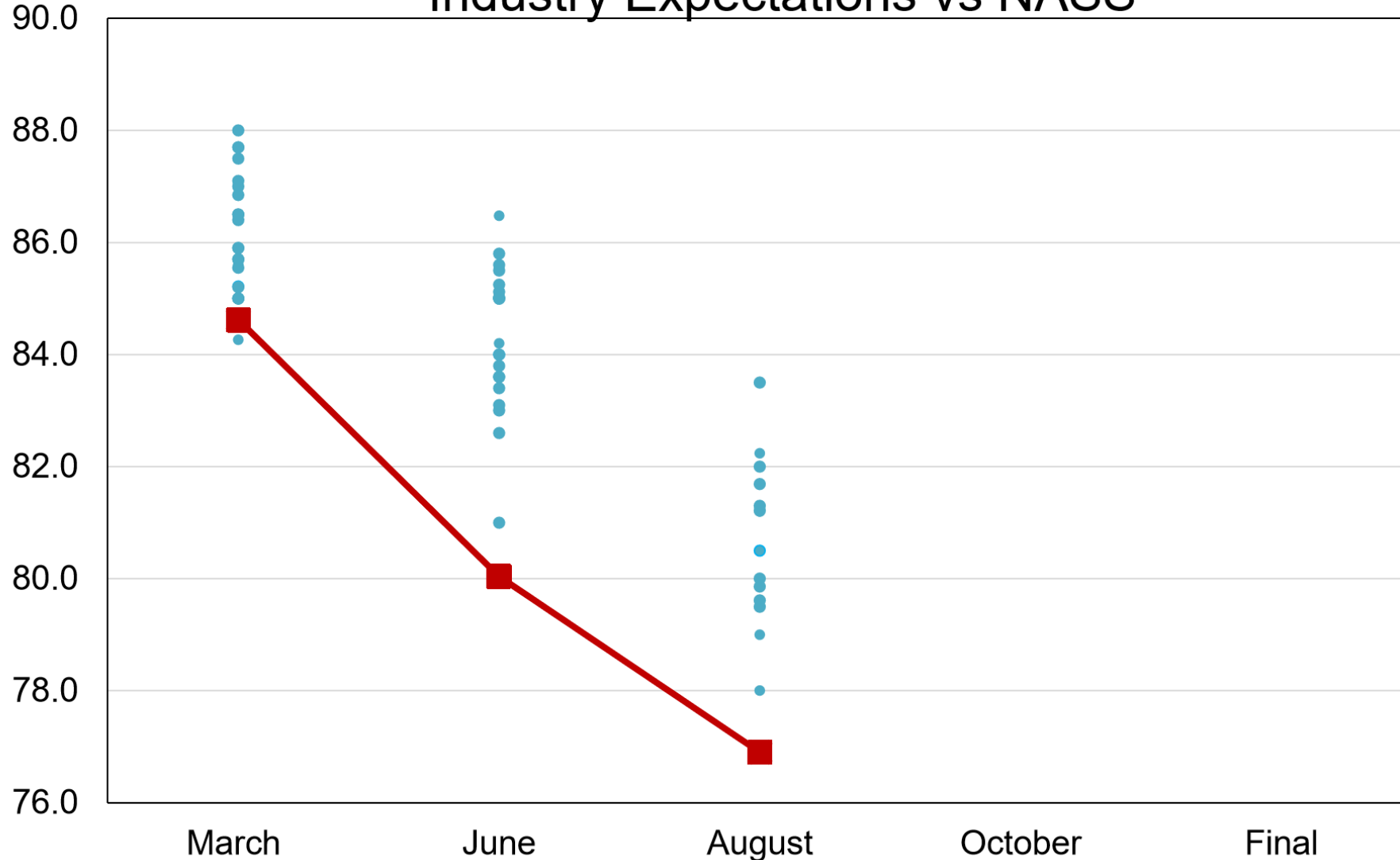


Source:
USDA,
August 2019



2019 United States Soybean Acres Industry Expectations vs NASS

Million Acres

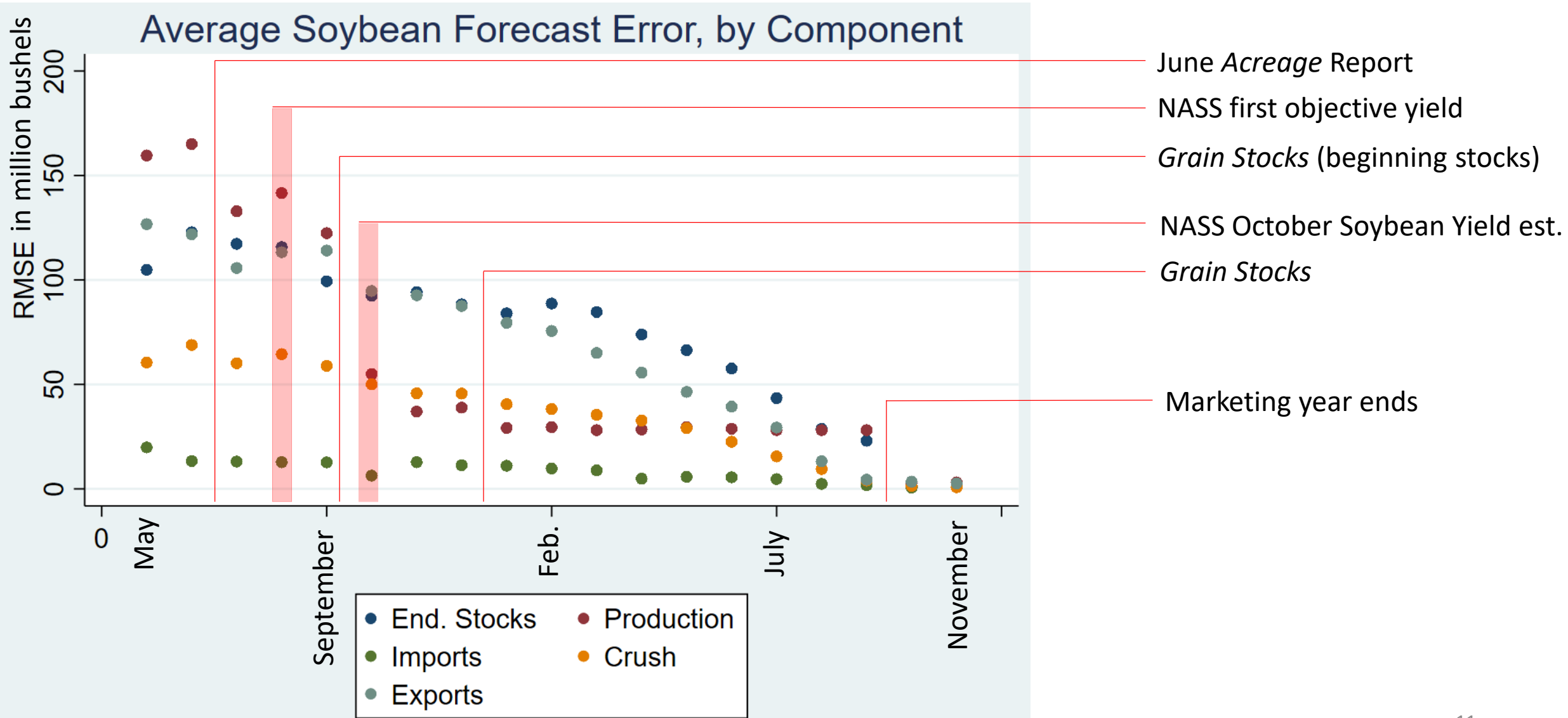


Source:
USDA,
August 2019

■ NASS Estimate ● Individual Industry Expectation

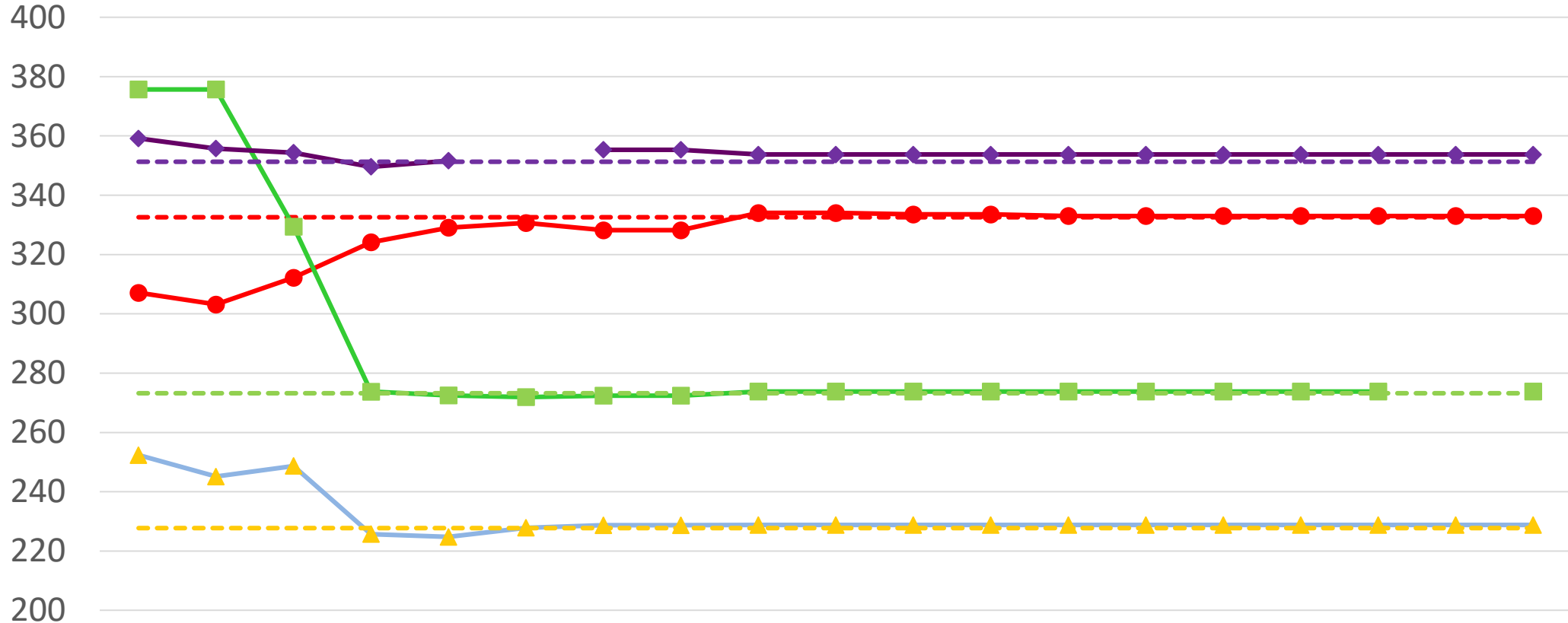
How key USDA reports affect U.S. forecast errors

Average Soybean Forecast Error, by Component



U.S. Corn Production Forecast Examples

Mil tonnes



May June July Aug Sept Oct Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct Nov

▲ 2002/03 F - - - 2002/03 A ● 2009/10 F - - - 2009/10 A

■ 2012/13 F - - - 2012/13 A ◆ 2013/14 F - - - 2013/14 A

Changes in WASDE Format over Time

- September 1973: First (W)ASDE covers U.S. wheat, rice, feedgrains, soybeans and products, upland cotton.
- April 1977: Season average farm price and range forecast introduced.
- October 1980: ASDE becomes WASDE with the inclusion of aggregated balances for major exporters and importers.
- April 1982: U.S. animal products forecasts introduced as standard feature.
- January 1985: Select country specific breakouts begin to appear in world tables, focused on trade.
- May/July 1985: New crop year rolls to 1985/86 and includes both US, global and, country breakouts for feed grains, rice and wheat. Soybeans only for the U.S until July.
- May 1997: China first appears in the world soybean table.
- May 2004: Corn for ethanol in the U.S. appears for the first time.
- May/June 2004: New crop year rolls to 2004/05, Soybeans rollout pulled forward to June.
- May 2009: Roll out of new marketing year now consistent for all crops.
- May 2019: World tables include World Less China and US tables drop price range for a point estimate.

WASDE Historical Database

- US Data complete (crops and livestock) back to 1973
- Global (by country) data back to 1995
 - Prior to this significant changes in country composition (EU, Soviet Union, etc)
- While the format has been stable for a decade, prior to this layout, variables and names changed often
 - Compiled using a combination of existing historical datasets, python code and brute force txt file->excel->data block
- Clean-up unified the 'same' variables under different names
 - Crushings -> Crush -> Domestic Crush
- Some variables have the 'same' name but check the footnote!
- 1.2 million data points

- What can the dataset tell us about uncertainty?

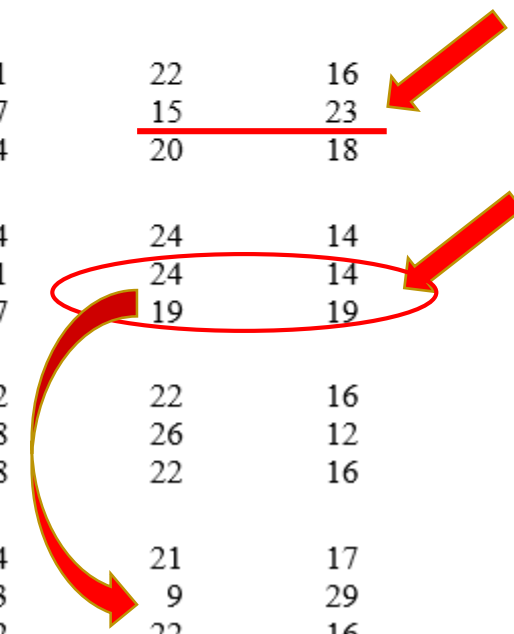
WASDE 'reliability'

November 2019

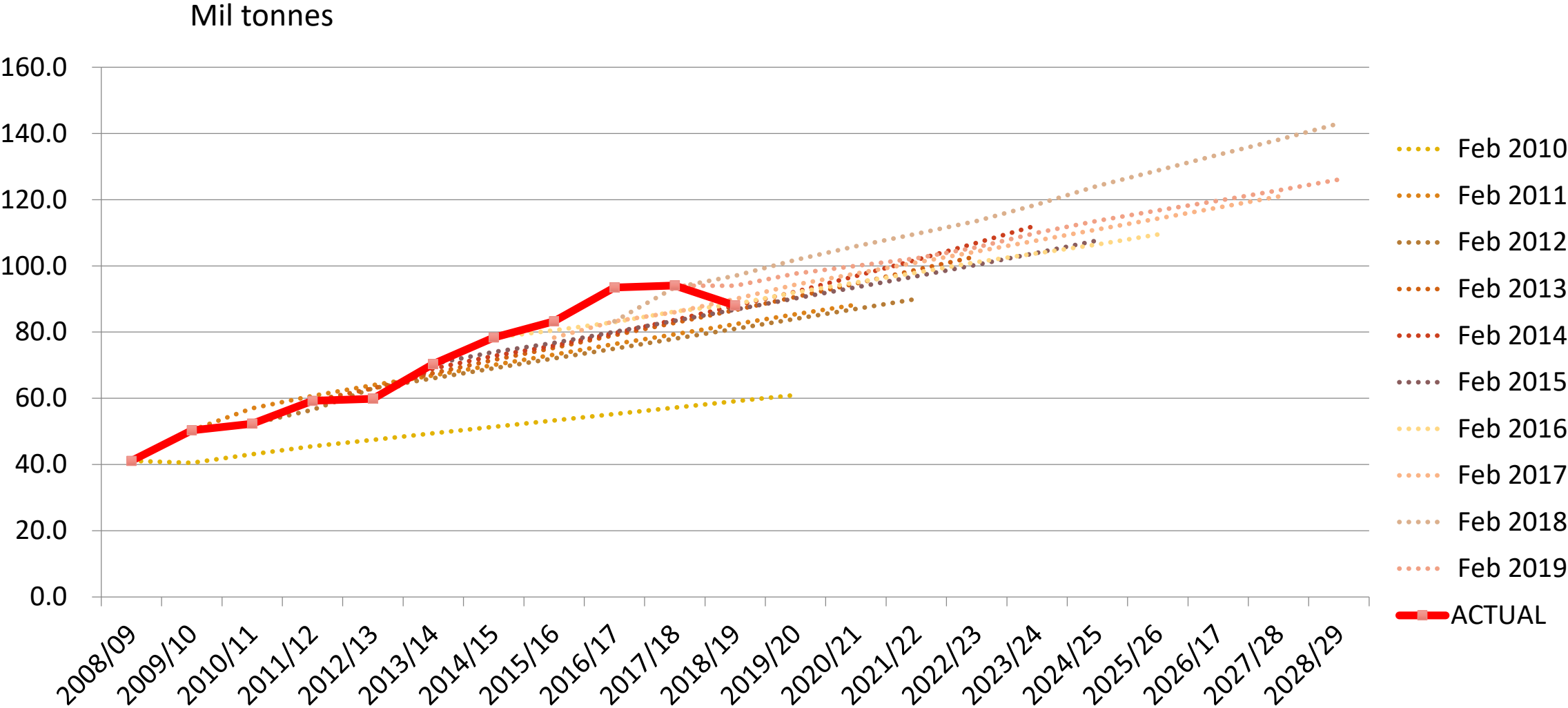
WASDE - 594 - 36

Reliability of November Projections (Continued) 1/

	Differences between forecast and final estimate							
	Root mean square error	90 percent confidence interval	Average	Smallest	Largest	Years Below Final	Years Above Final	
	<i>Percent</i>		<i>Million Metric Tons</i>					
SOYBEANS								
Production								
World	4.0	6.8	6.1	0.1	25.1	22	16	
U.S.	2.2	3.7	1.2	0.1	4.7	15	23	
Foreign	6.6	11.2	5.9	0.0	26.4	20	18	
Exports								
World	7.2	12.3	3.4	0.0	13.4	24	14	
U.S.	10.1	17.2	2.4	0.1	7.1	24	14	
Foreign	18.2	30.8	2.8	0.1	11.7	19	19	
Domestic Use								
World	2.9	4.9	4.1	0.0	14.2	22	16	
U.S.	3.6	6.2	1.3	0.0	3.8	26	12	
Foreign	3.6	6.1	3.9	0.2	12.8	22	16	
Ending Stocks								
World	16.3	27.6	4.4	0.0	18.4	21	17	
U.S.	48.7	82.6	2.3	0.1	7.3	9	29	
Foreign	17.3	29.4	3.9	0.1	18.2	22	16	



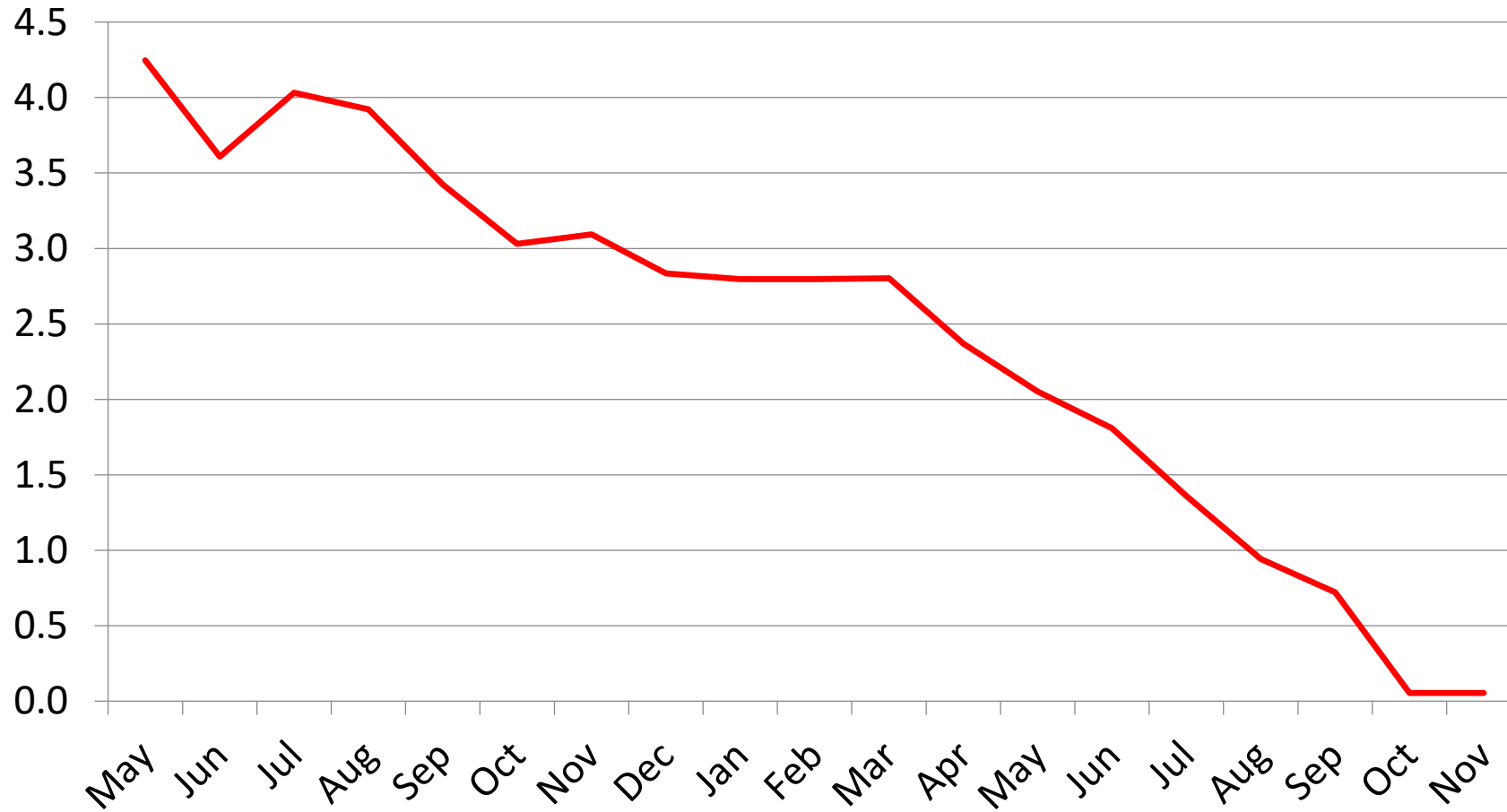
Decomposing soybean forecast errors: under-estimating China soybean import demand?



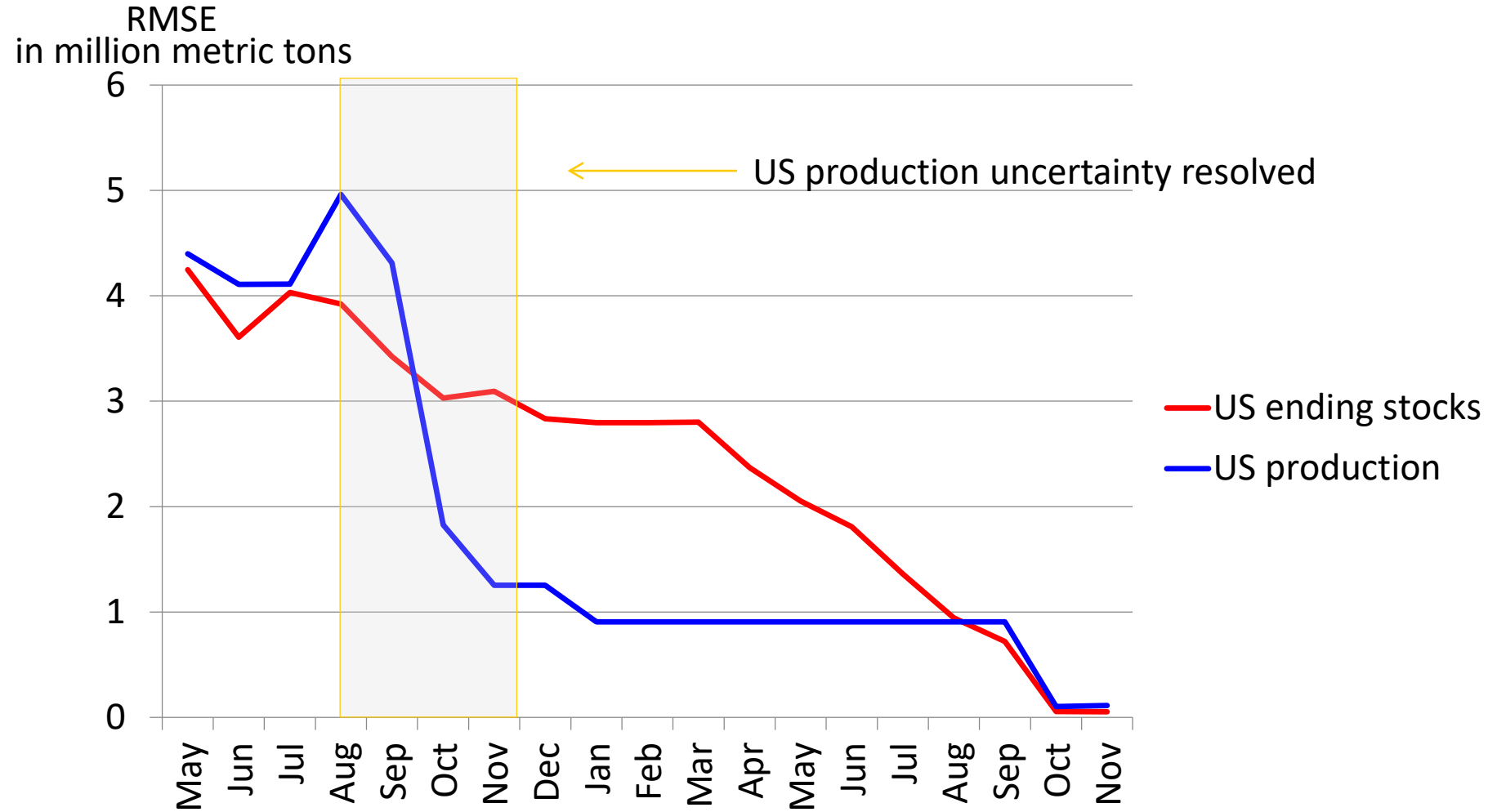
Source: USDA, 10-Year Baseline Projections, various years

Forecast error declines over time: US soybean ending stocks

RMSE
in million metric tons

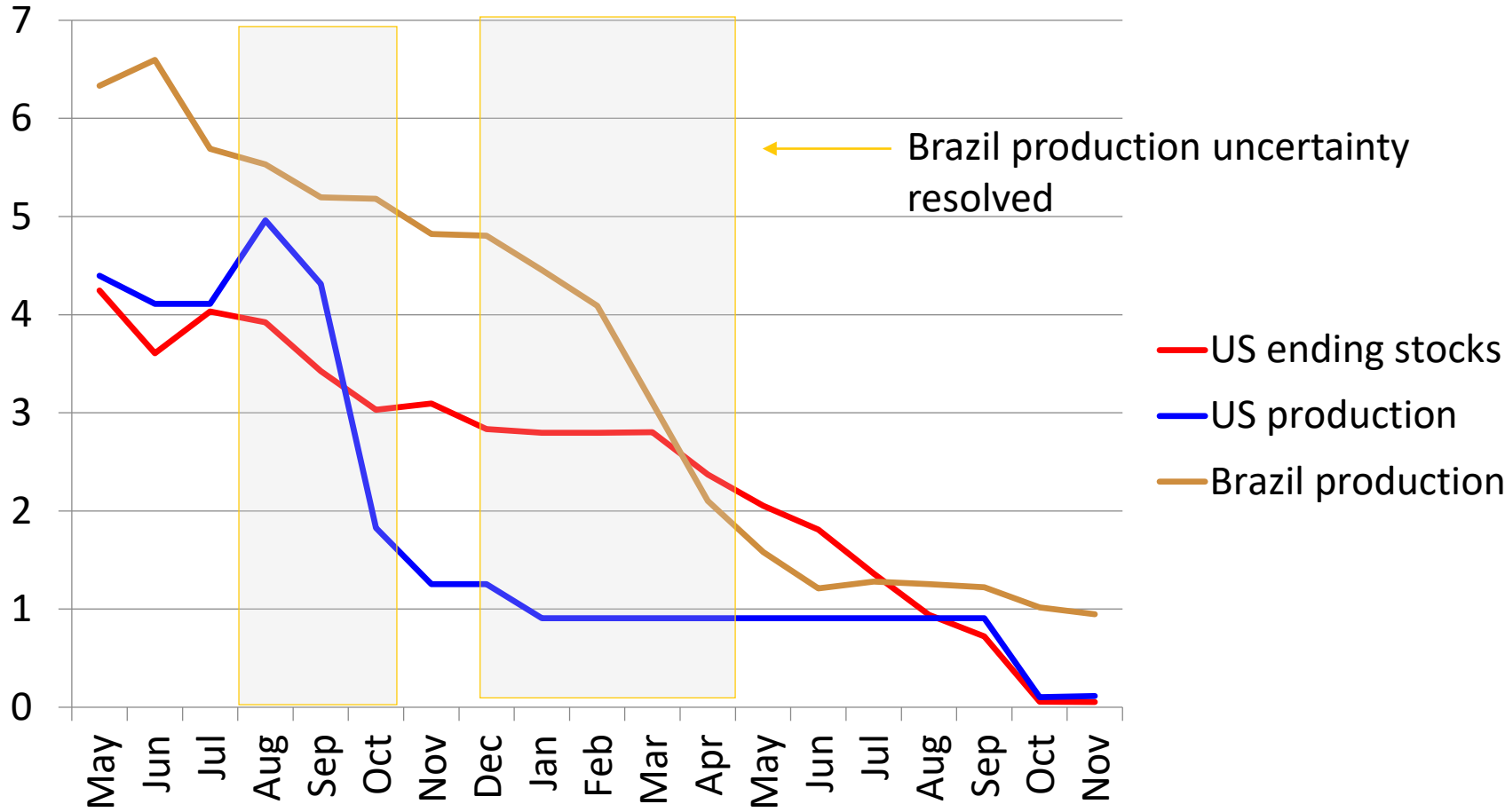


Decomposing forecast error: US soybean ending stocks

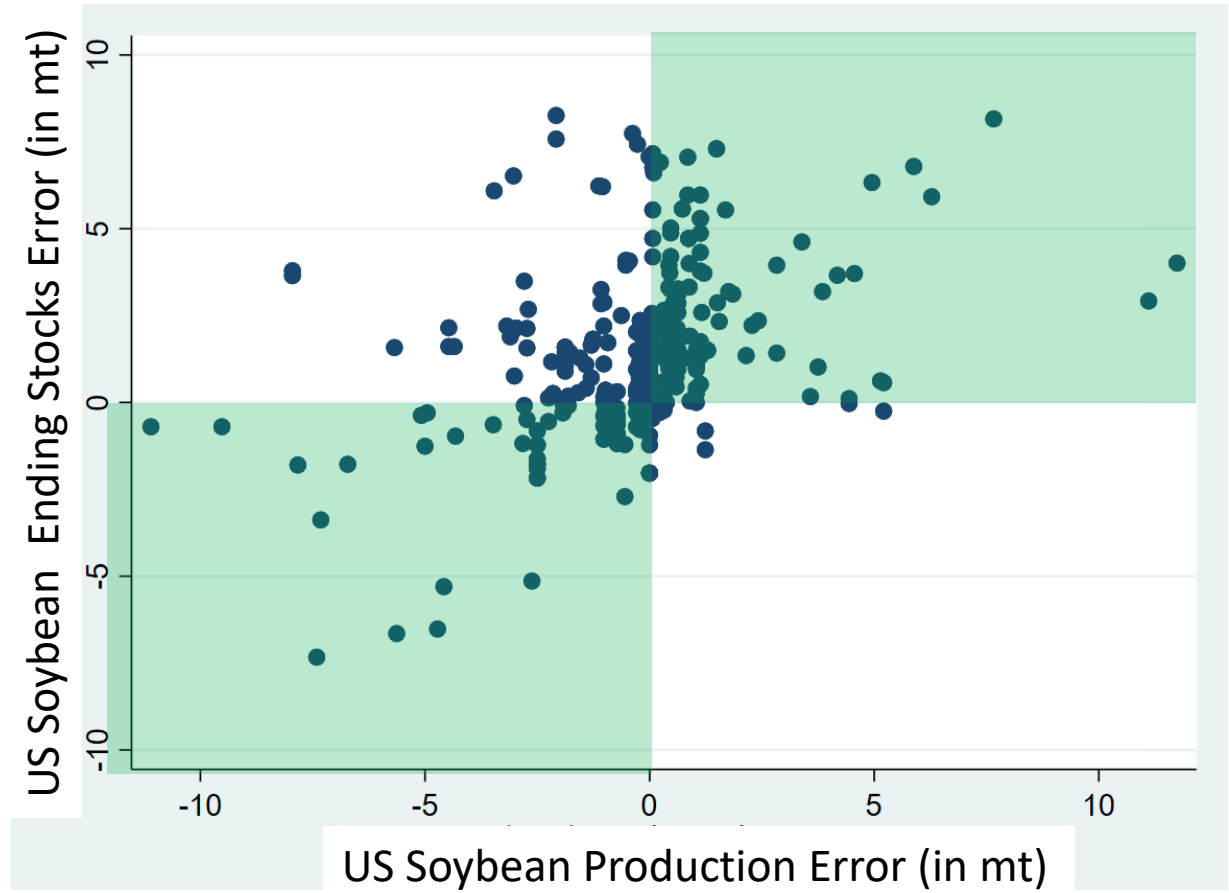
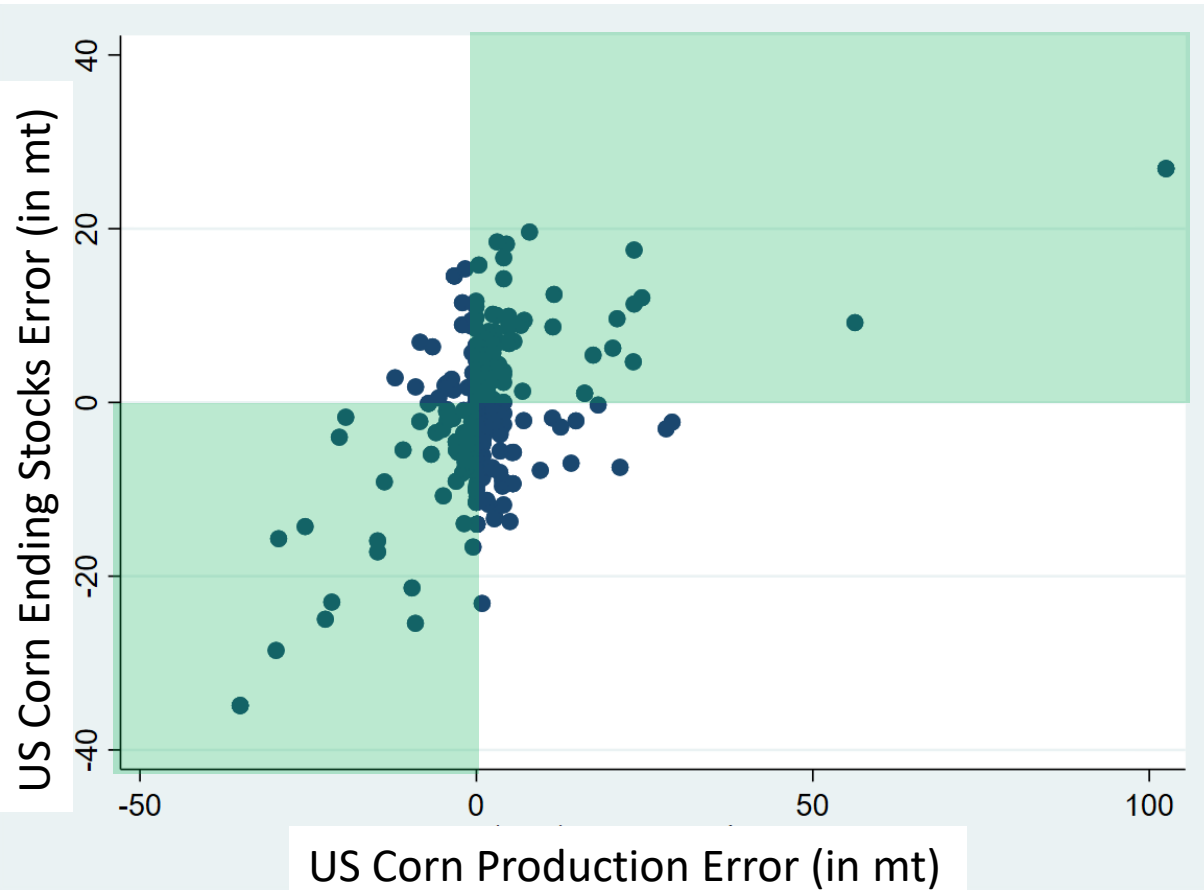


Decomposing forecast error: US soybean ending stocks

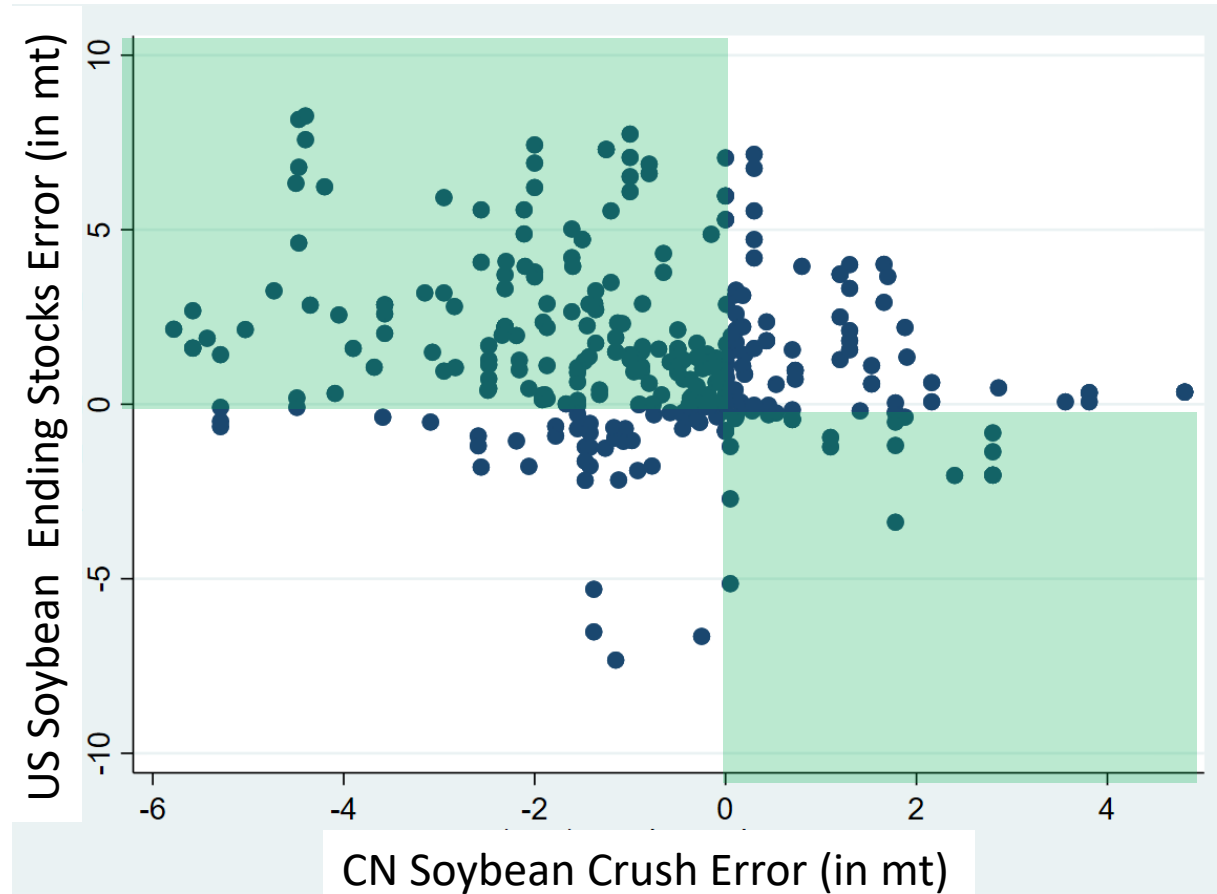
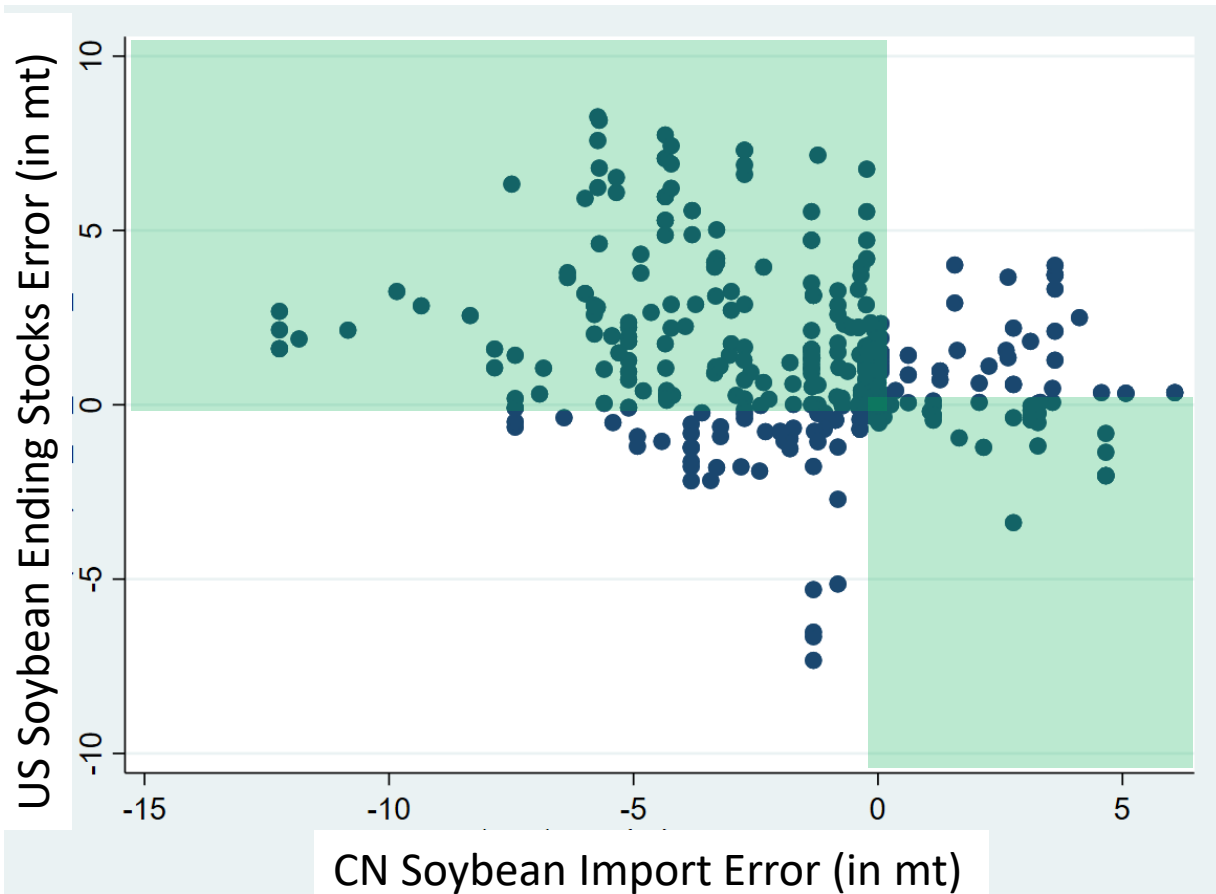
RMSE
in million metric tons



Corresponding Errors in Forecast Stocks and Production, Corn and Soybeans



Corresponding Errors in Forecast US Soybean stocks vs China Imports and Crush



Forecast error: soybean ending stocks *no fixed effects*

	US ending stocks	Global ending stocks	Global ending stocks minus China
Constant	1.186***	-0.044	0.313
US soybean production	0.407***	0.336***	0.329***
China soybean crush	-0.344***	-0.251	-0.952***
Brazil soybean production	-0.053*	0.706***	0.719***
Brazil soybean production-post planting	0.421***	---	---
Adjusted R ²	0.2401	0.205	0.199
Root MSE	2.066	5.410	5.482

*** Significant at 99th percentile

** Significant at 95th percentile

* Significant at 90th percentile

Forecast error: soybean ending stocks with fixed effects (*Dummies for marketing year and for 'forecast #'*)

	US ending stocks	Global ending stocks	Global ending stocks minus China
Constant	0.330***	5.537***	5.741***
US soybean production	0.409***	0.648***	0.606***
China soybean crush	-0.355***	-0.841***	-1.485***
Brazil soybean production	-0.095***	0.805***	0.806***
Brazil soybean production-post planting	0.330***	---	---
Adjusted R ²	0.6629	0.715	0.7189
Root MSE	1.376	3.224	1.446

*** Significant at 99th percentile

** Significant at 95th percentile

* Significant at 90th percentile

Forecast error: wheat ending stocks with fixed effects (*Dummies for marketing year and for 'forecast #'*)

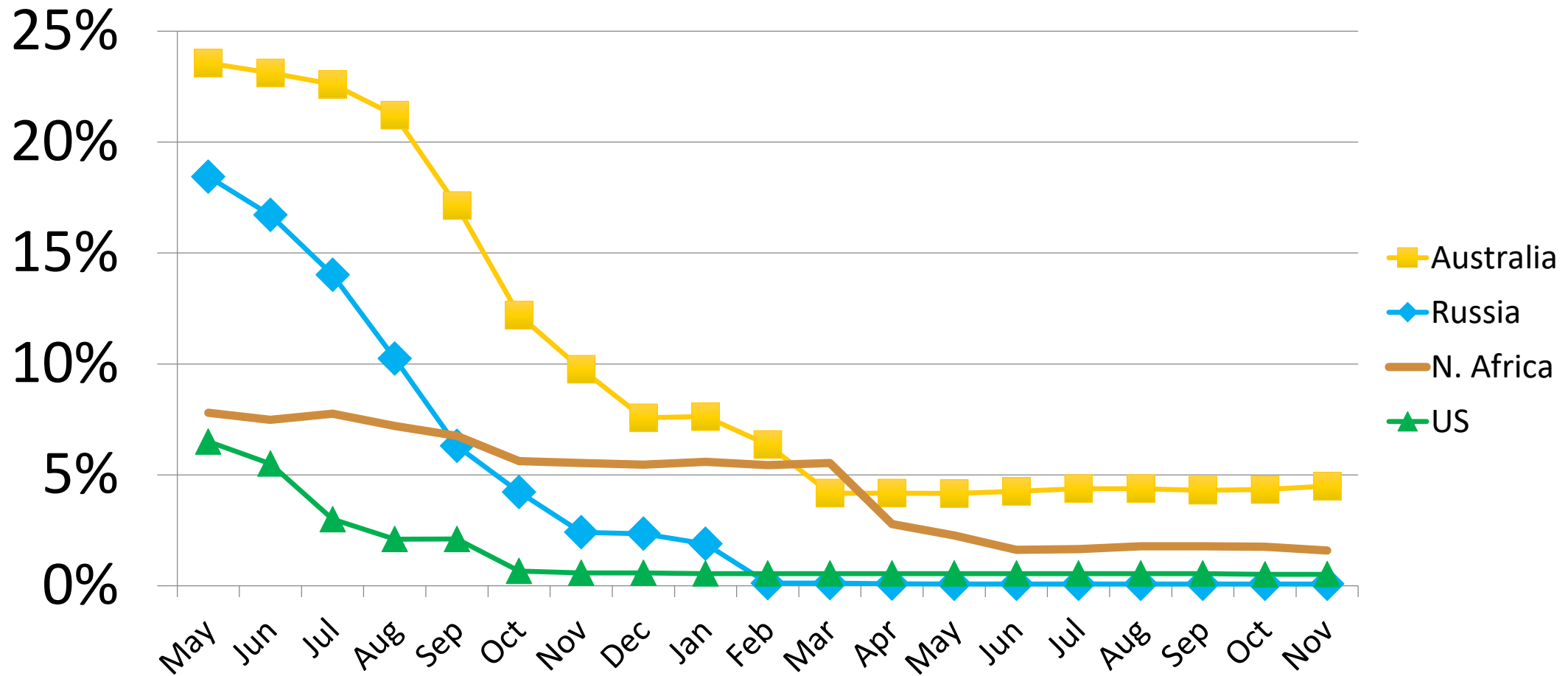
	US ending stocks	Global ending stocks	Global ending stocks minus China
Constant	-0.833*	-9.417***	-2.063
US production	0.707***	0.222	1.189***
FSU production	0.185***	0.996***	0.846***
Australia production	0.123***	0.719***	1.331***
North Africa imports	-0.317***	-0.822	-0.328
Adj R ²	0.585	0.875	0.664
Root MSE	1.313	7.541	5.428

*** Significant at 99th percentile

* Significant at 90th percentile

Wheat production forecast error

Percent RMSE



Areas to examine

- Identify forecast areas of 'least confidence' and of 'high importance'
 - Importance could vary depending on objective.
- Examine the timing of the result of forecast error and what improvements could be made.
 - Some uncertainty is simply a function of a developing crop and uncertain weather?
- Identify areas of 'repeated error' or bias and more importantly their origin.