Sources of Bias in the USDA International Baseline Projections

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Background and Motivation

- Annually released, 10-year projection series for a number of agricultural commodities and over 30 countries
- The baseline projections present a neutral policy scenario assuming a specific macroeconomic situation
- Aid in preparing Farm Bills and annual Presidential budgeting

- But various USDA projections and forecasts suffer from bias which limit their informativeness (Bora, Katchova, and Kuethe, 2022,0; Regmi et al., 2021; Isengildina-Massa et al., 2021; Kuethe, Hubbs, and Sanders, 2018)

Research Objectives

1. Do the projections for various regions tend to be herded together?
   - **Dynamic time warping distance algorithm** is used to measure similarity among projections of different regions $\Longrightarrow$ herding.
   - We measure similarity in realized data to assess the rationality of herding.

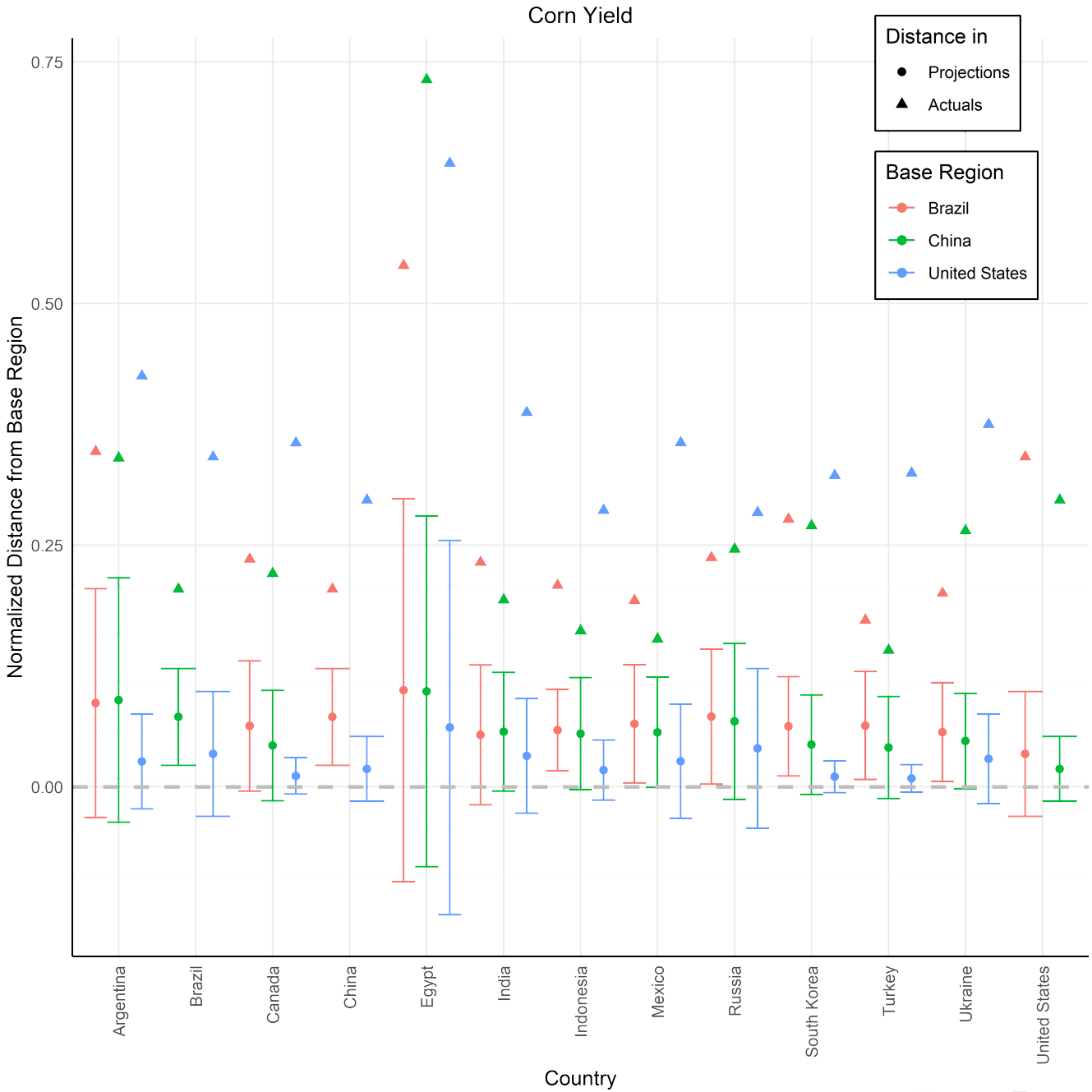
2. Does herding behavior contribute to bias?
   - Regression analysis is used to map the relationship between the degree of herding and the scale of bias in the projections.

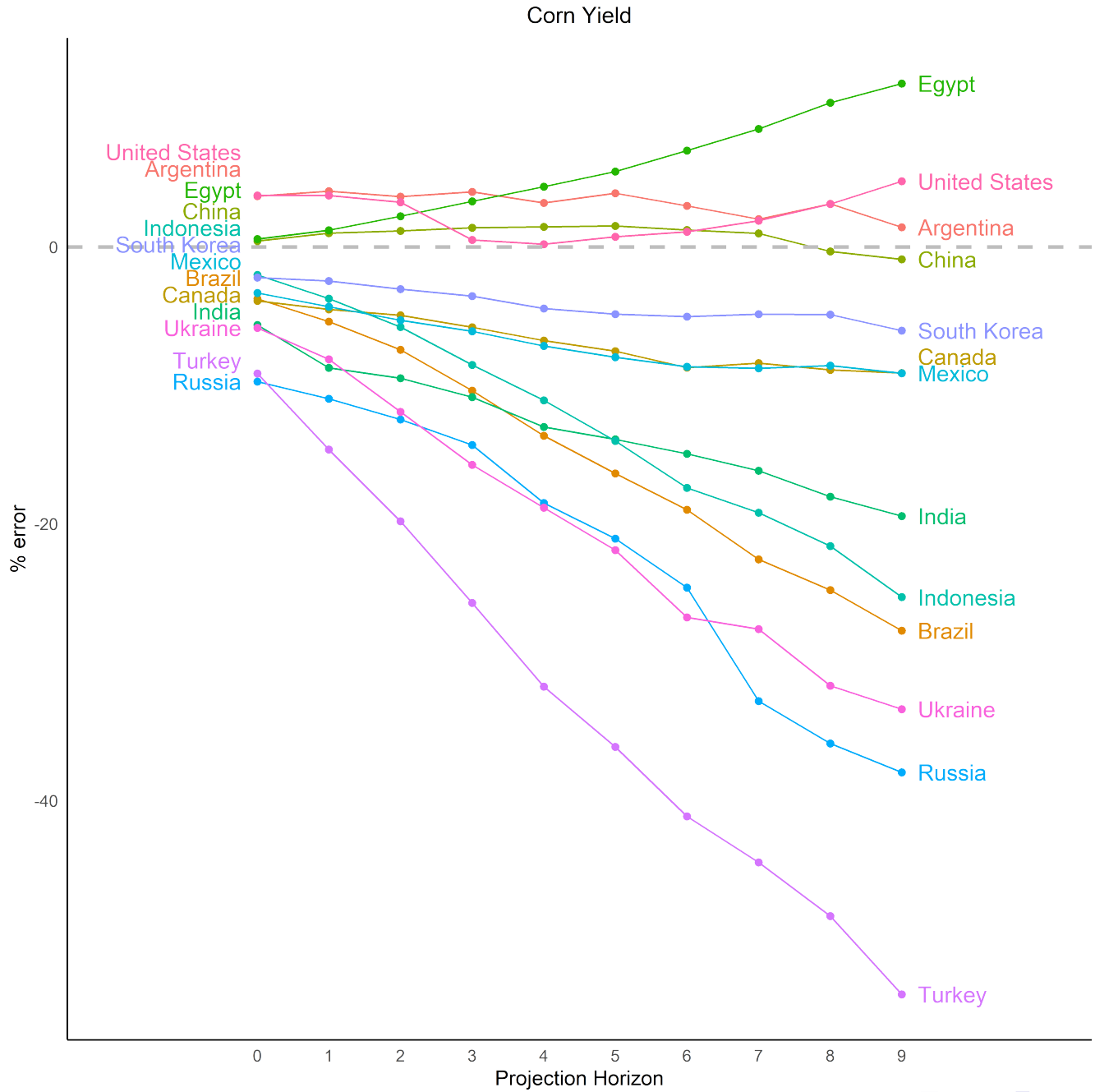
Data: USDA International Baseline Projection reports from 2002 to 2021.

Where can herding come from?

- Herding: investors and experts with private information align their choices and decisions with others as a risk management strategy.
  - Rational $\Longrightarrow$ choice is made using superior private information.
  - Irrational $\Longrightarrow$ private information is ignored to adopt similarity (Devenow and Welch, 1996).

- Herding in the USDA Baseline Projections can occur at
  - Stage 1: Country-specific models and teams
  - Stage 2: Commodity meetings for Interagency committee finalizing all the projections


Corn Yield
Distance in
Projections
Actuals
Base Region
Brazil
China
United States
Normalized Distance from Base Region
0.75
0.50
0.25
0.00
Argentina
Brazil
Canada
China
Egypt
India
Indonesia
Mexico
Russia
South Korea
Turkey
Ukraine
United States
Country


Corn Yield
% error
0
-20
-40
0
1
2
3
4
5
6
7
8
9
Projection Horizon
United States
Argentina
Egypt
China
Indonesia
South Korea
Mexico
Brazil
Canada
India
Ukraine
Turkey
Russia

Parametric Analysis

- We estimate the relationship between herding and bias in the baseline projection using the following regression:

$$LoggedError_{rh} = \beta_0 + \beta_1 log(DistanceFromBase)_{rh} + \beta_2 DistanceIsRational_r + \epsilon_{rh} \quad (1)$$

- $DistanceFromBase_{rh}$ = computed DTW distance of country r's projections from the US for each projection horizon.
- $DistanceIsRational_r$ = an indicator variable that takes a value of 1 if the distance in the realized series lies within the confidence interval of the average distance in the projections of country r from the US.

Estimation results for equation (1) using distance from base region as a measure of herding.

Variable	Yield	Area Harvested	Imports	Exports	Total Consumption	Ending Stocks
Corn						
Distance from Base$_r$ (logged)	0.0106*	-0.0617	-0.7131***	0.152	0.0023	-0.4544***
	(0.0061)	(0.0551)	(0.1654)	(0.1344)	(0.0161)	(0.1024)
Distance is Rational$_r$	0.407***		1.3221***	-0.208	-0.1079***	0.366
	(0.0644)		(0.3034)	(0.1950)	(0.0322)	(0.2273)
Soybeans						
Distance from Base$_r$ (logged)	3e-04	0.2593**	-0.7046**	0.0913	-0.2282	-0.1836*
	(0.0113)	(0.1284)	(0.3282)	(0.1464)	(0.1544)	(0.1110)
Distance is Rational$_r$	-0.0628***	-0.8825***	-0.4732	0.3019*	-0.0191	-1.1144*
	(0.0238)	(0.1490)	(0.8614)	(0.1684)	(0.1899)	(0.5812)
Wheat						
Distance from Base$_r$ (logged)	-0.046***	-0.0734***	0.0676	-0.4631***	-0.0205**	-0.1793***
	(0.0112)	(0.0263)	(0.0658)	(0.1245)	(0.0087)	(0.0341)
Distance is Rational$_r$	0.0753***	0.0243	0.053	0.4419*	-0.0275*	
	(0.0216)	(0.0553)	(0.1588)	(0.2350)	(0.0150)	

- Soybean imports and ending stocks, and wheat area harvested $\Longrightarrow$ similarity in projections with the US is associated with more accurate projections for the other countries.
- Corn total consumption, soybeans exports & total consumption, and wheat exports & total consumption $\Longrightarrow$ correlation in projection trends is significantly associated with lower accuracy of the projections.

Thank you!

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References

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