

The Expectations of Agricultural Bankers

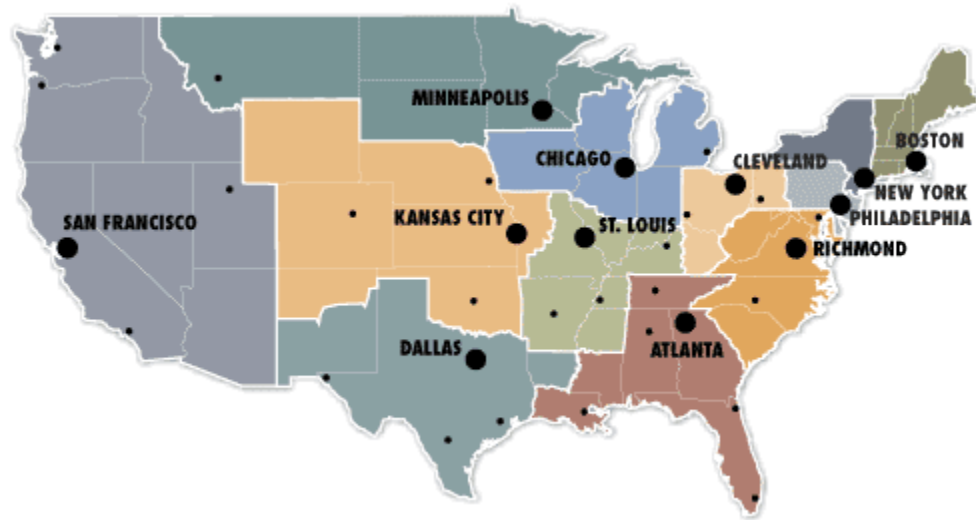
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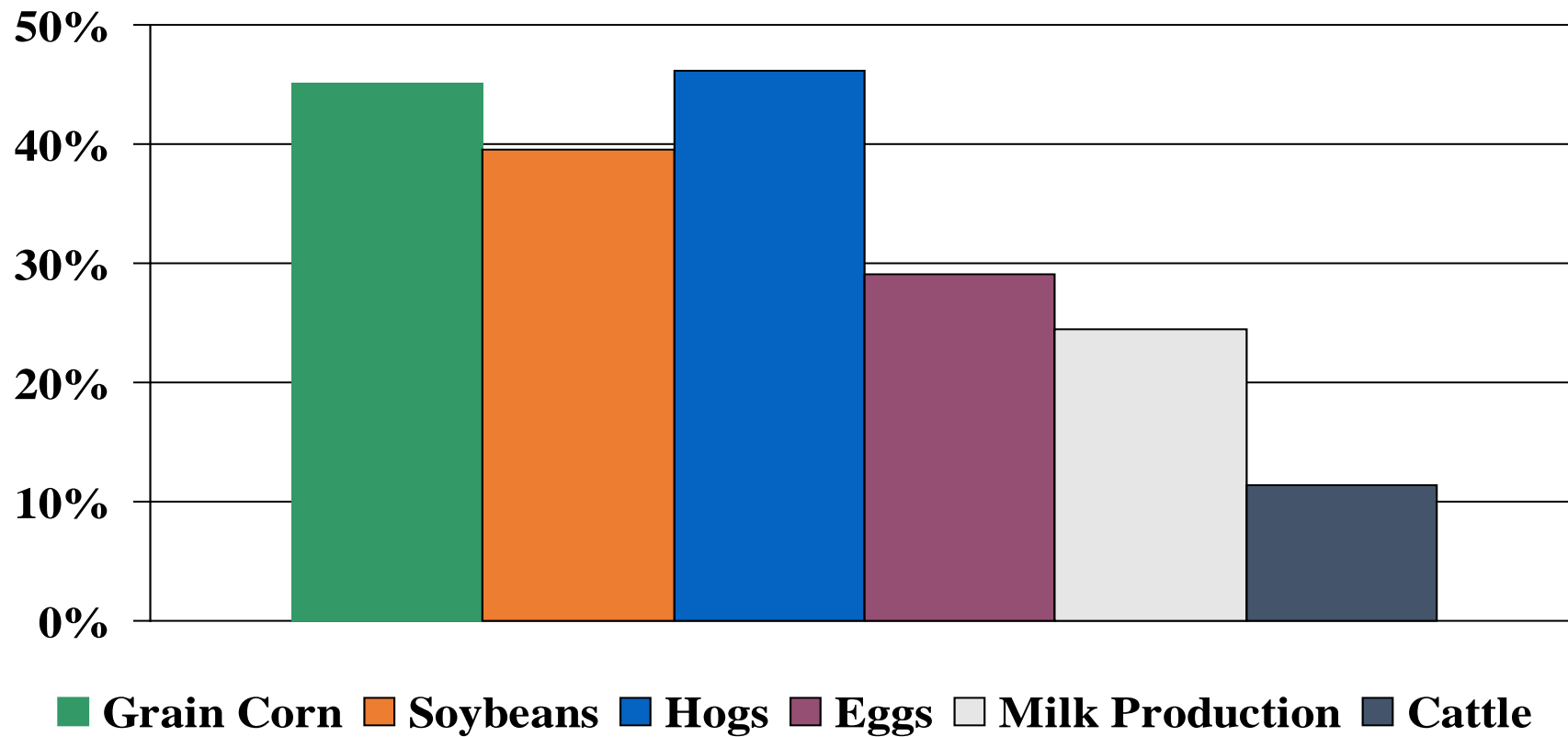
Land Value and Credit Conditions Survey



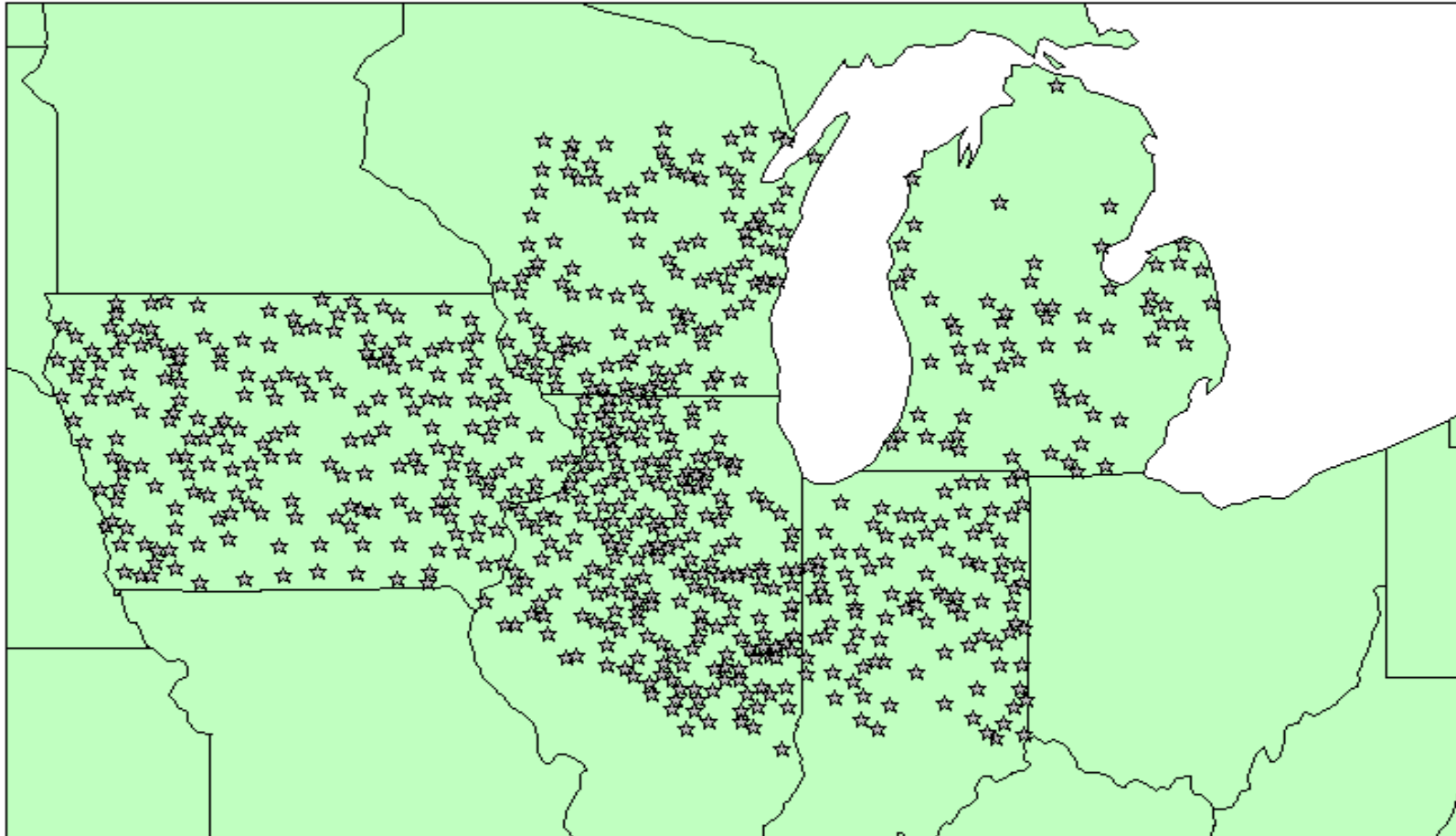
- Federal Reserve Bank of Chicago (7th District)
- IL, IN, IA, MI, and WI
- About 25% of US agricultural banks
- Midwest agriculture: corn, soybeans, hogs, eggs, dairy, cattle, fruit & vegetable

7th District Agriculture Products

(5 states as % of U.S. total, 2016)



Participating Banks in 7th District Land Value and Credit Conditions Survey



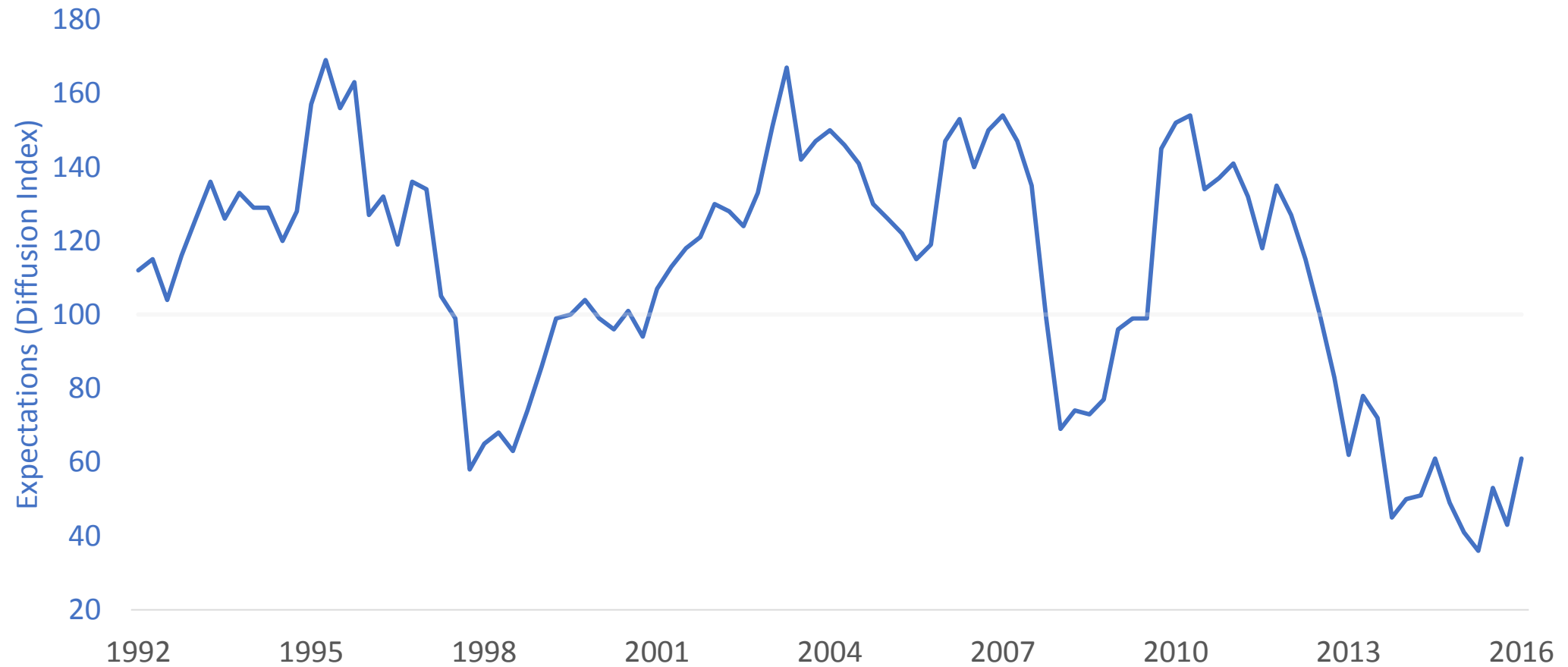
Land Value and Credit Conditions Survey

What trend in farmland values do you expect in your area in the next three months?

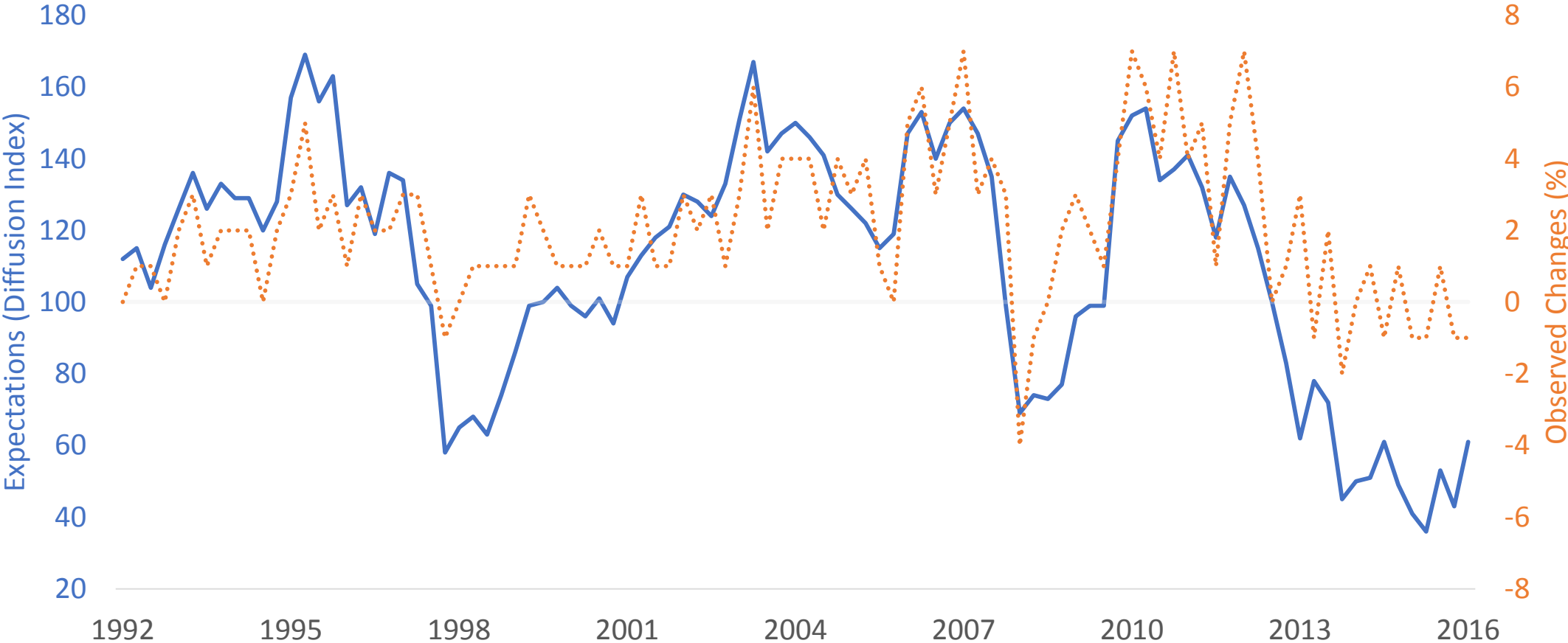
Possible answers: Up, Down, or Stable

- Good predictor of District farm real estate values (Covey, 1999; Zakrzewicz, et al., 2013 (KC Fed survey))
- Report diffusion index (balance statistic) quarterly
 - $(\text{Up} - \text{Down}) + 100$

Diffusion Index of Expected Changes



Diffusion Index of Expected Changes



Land Value and Credit Conditions Survey

What trend in farmland values do you expect in your area in the next three months? Answers: Up, Down, or Stable

Very common elicitation method in business surveys:

- Respondents reluctant to report quantitative assessment
- Avoids “spurious precision”
- Less respondent burden

Yet...

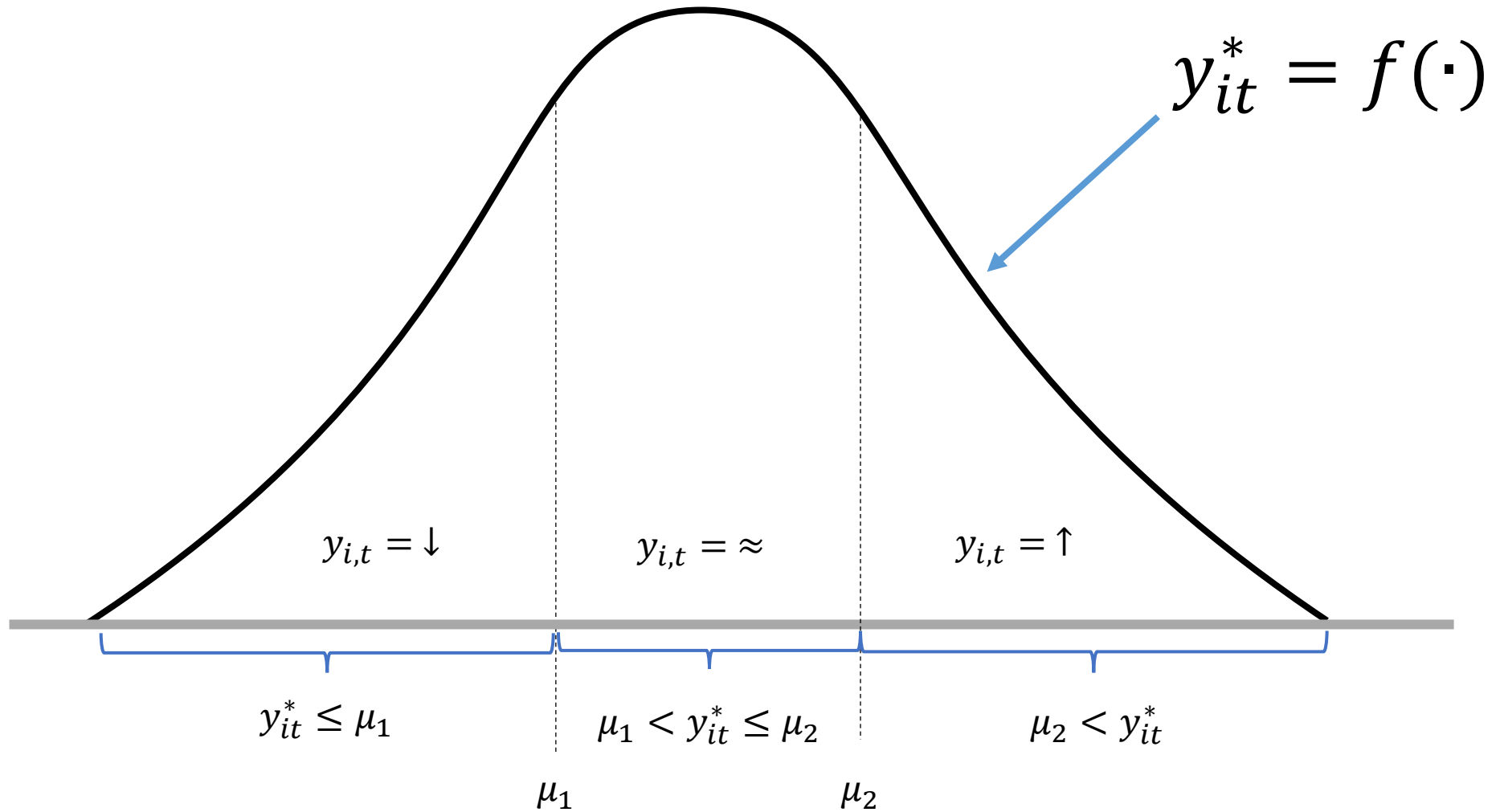
- Can be difficult to interpret: *What do bankers actually mean by “up”?*
- Assumes symmetry of “up” and “down”

Theory

Assume:

- Respondents have some unobservable continuous distribution of expectations (latent expectations)
- The (ordinal) discrete responses are based on unobserved threshold values

Bankers' (Latent) Expectations

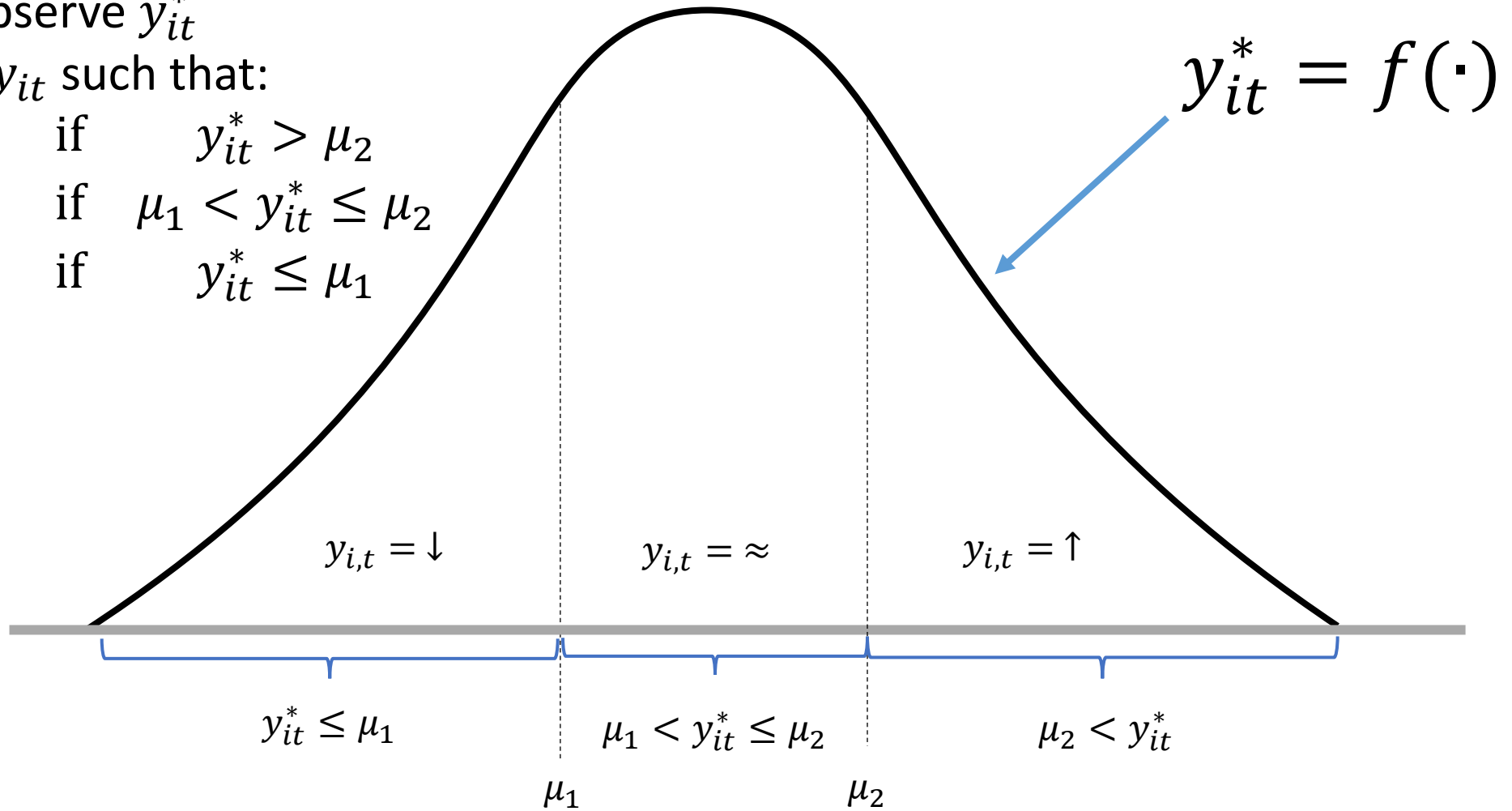


Bankers' (Latent) Expectations

We do not observe y_{it}^*

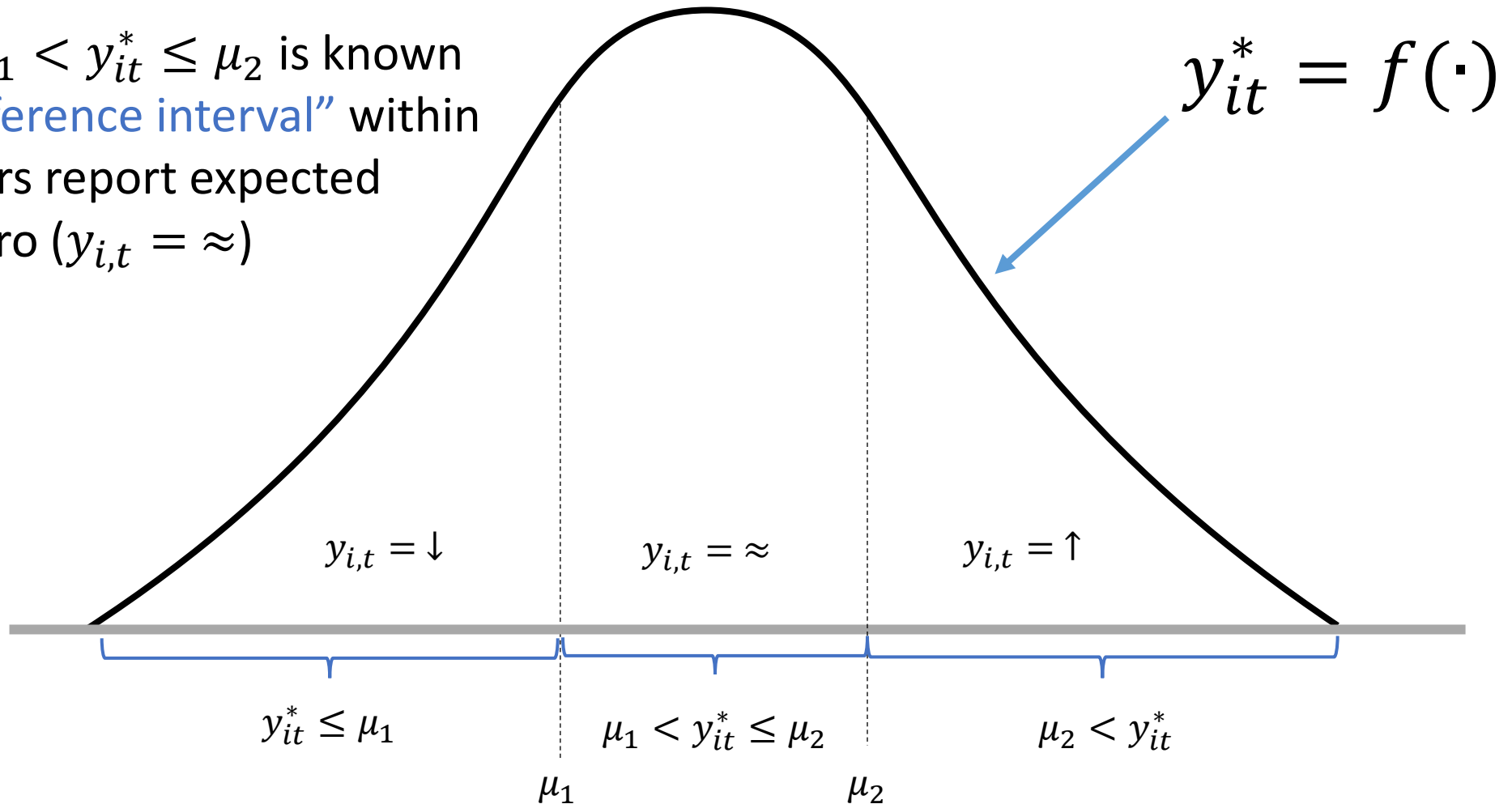
We observe y_{it} such that:

$$y_{it} = \begin{cases} \uparrow & \text{if } y_{it}^* > \mu_2 \\ \approx & \text{if } \mu_1 < y_{it}^* \leq \mu_2 \\ \downarrow & \text{if } y_{it}^* \leq \mu_1 \end{cases}$$



Bankers' (Latent) Expectations

The region $\mu_1 < y_{it}^* \leq \mu_2$ is known as the “**indifference interval**” within which bankers report expected change of zero ($y_{i,t} = \approx$)



Bankers' (Latent) Expectations

- A number of empirical methods have been proposed to estimate quantitative “mean” expectations (\bar{y}_{it}^*) and indifference interval (μ_1, μ_2) from **aggregate** survey responses
 - Probability method of Carlson and Parkin (1975)
 - Regression method of Pesaran (1984)
- Methods have a number of recognized limitations (Nardo, 2003)
 - Restrictive assumptions of indifference interval
 - Respondent heterogeneity
 - Assumed distribution of y_{it}^*
- More recent studies exploit respondent-level data (Lahiri and Zhao, 2015)

Empirical Model

- Estimate the distribution of bankers' (latent) expectations (y_{it}^*) through **ordered choice regression**

$$y_{it} = \begin{cases} \uparrow & \text{if } y_{it}^* = \sum_t \alpha_t D_{it} + \varepsilon_{it} > \mu_2 \\ \approx & \text{if } \mu_1 < y_{it}^* = \sum_t \alpha_t D_{it} + \varepsilon_{it} \leq \mu_2 \\ \downarrow & \text{if } y_{it}^* = \sum_t \alpha_t D_{it} + \varepsilon_{it} \leq \mu_1 \end{cases}$$

where D_{it} is a dummy variable = 1 if bank i responded in quarter t

Ordered Choice Regression

- Bankers' expectations are a function quarter and i.i.d. error
- We must make an assumption on the distribution of the error (link function): $F(\cdot)$
- The model estimates the probabilities:

$$\begin{aligned} P[y_i = \uparrow] &= 1 - F\left(\frac{\mu_2 - \alpha_t D_{it}}{\sigma}\right) \\ P[y_i = \approx] &= F\left(\frac{\mu_2 - \alpha_t D_{it}}{\sigma}\right) - F\left(\frac{\mu_1 - \alpha_t D_{it}}{\sigma}\right) \\ P[y_i = \downarrow] &= F\left(\frac{\mu_1 - \alpha_t D_{it}}{\sigma}\right) \end{aligned}$$

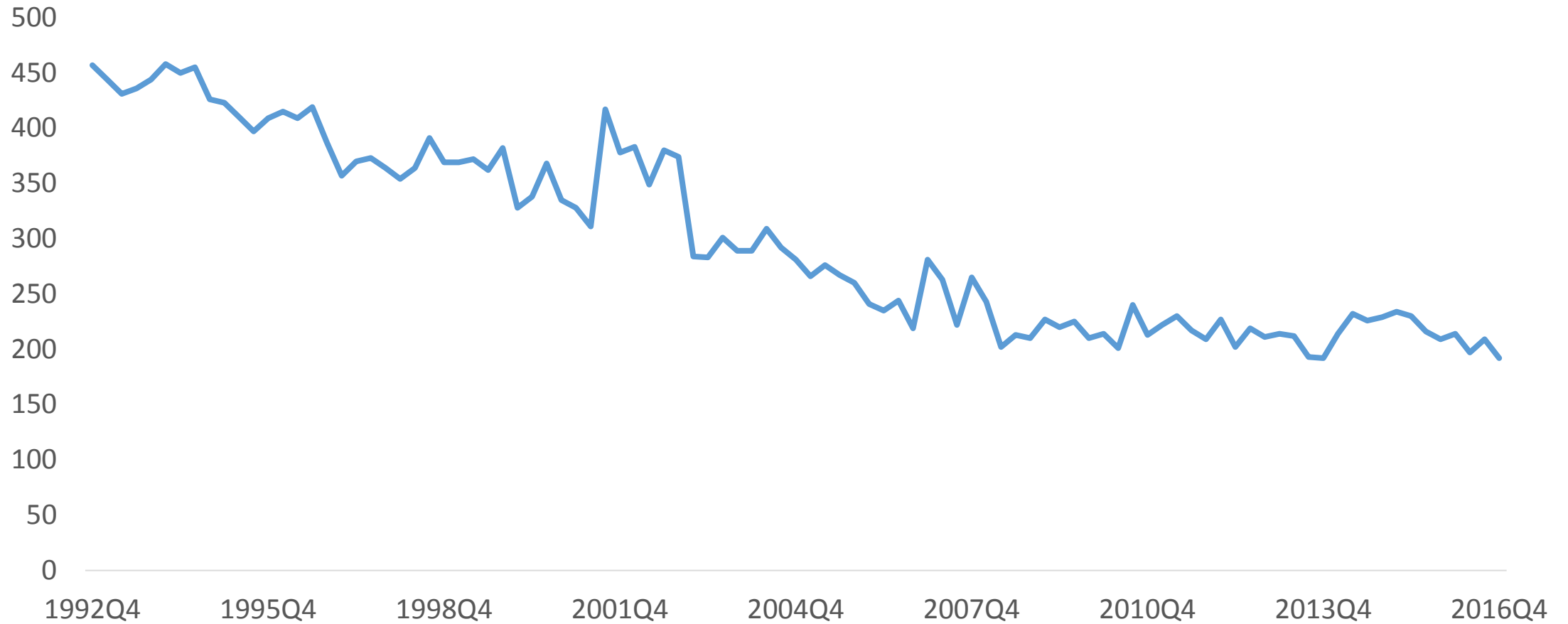
Ordered Choice Regression

- The ordered choice model can be estimated under a variety of link distributions
 - Probit (normal)
 - Logit (logistic)
 - Log-log
 - Cauchit (cauchy)
- Can include additional regressions (observed heterogeneity)

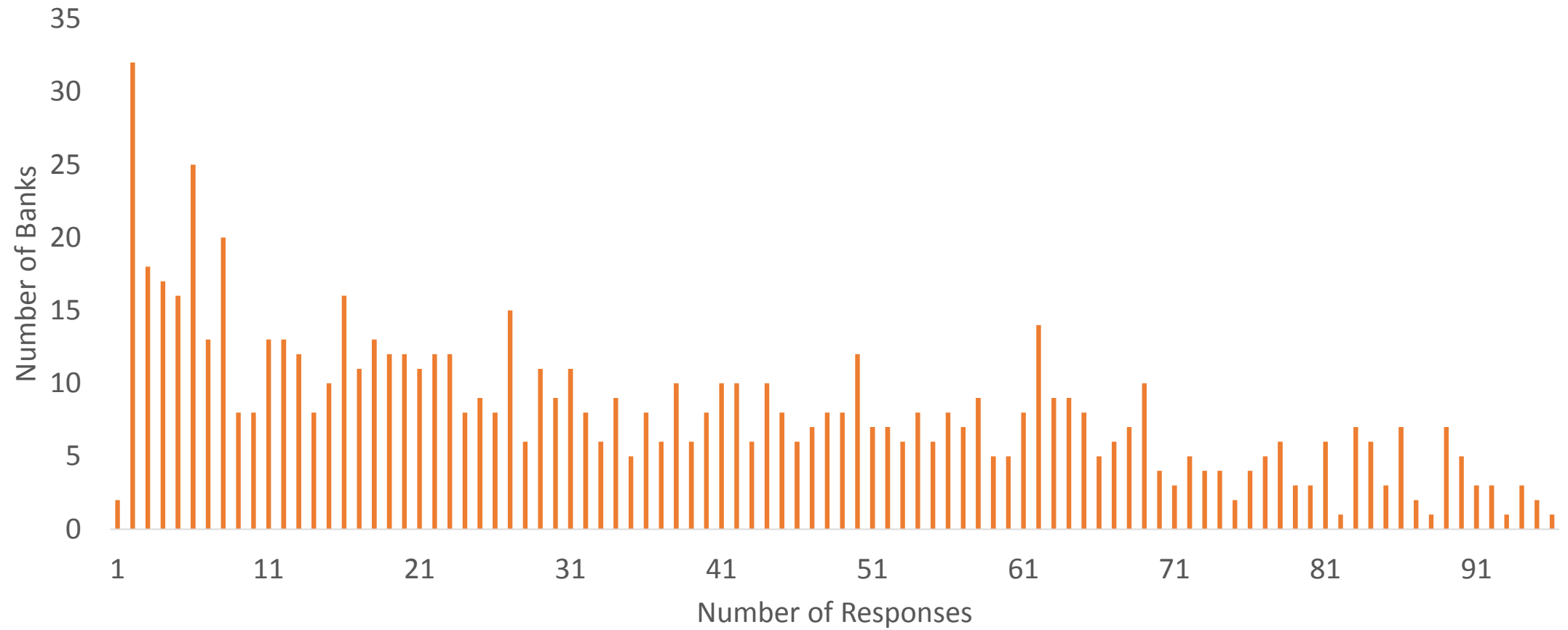
Preliminary Results

- Ordered probit model (standard normal link function)
- 787 banks
- 1992Q4 – 2016Q4 (97 quarters)
- 21,121 observations
- Mean of 36.6 responses per bank

Responses per Quarter



Responses per Bank



Preliminary Results

	Estimate	Std. Error	Sig.
μ_1	-1.472	0.059	***
μ_2	0.862	0.058	***

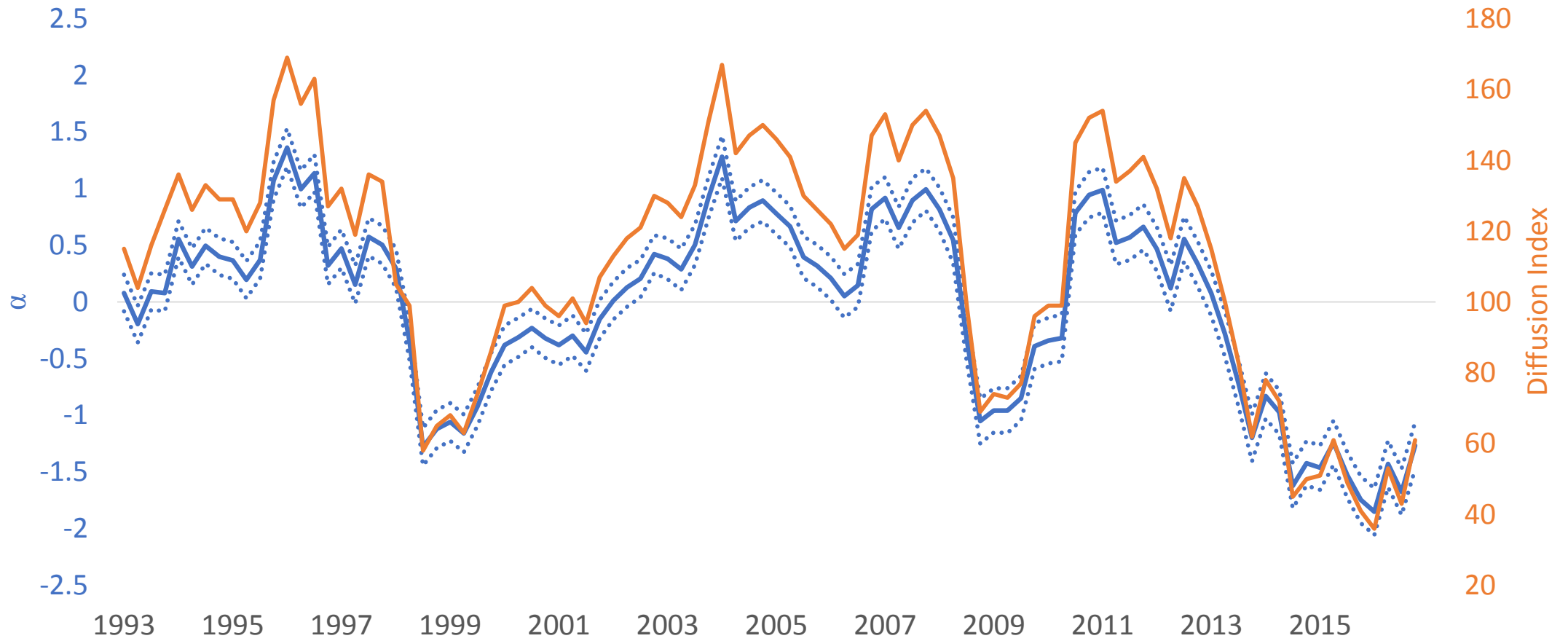
*** $\alpha \leq 0.01$

- Lenders have asymmetric indifference interval
- In order to report “down,” bankers believe that farm real estate values will fall by more than 1.47%
- In order to report “up,” bankers believe that farm real estate values will rise by more than 0.86%

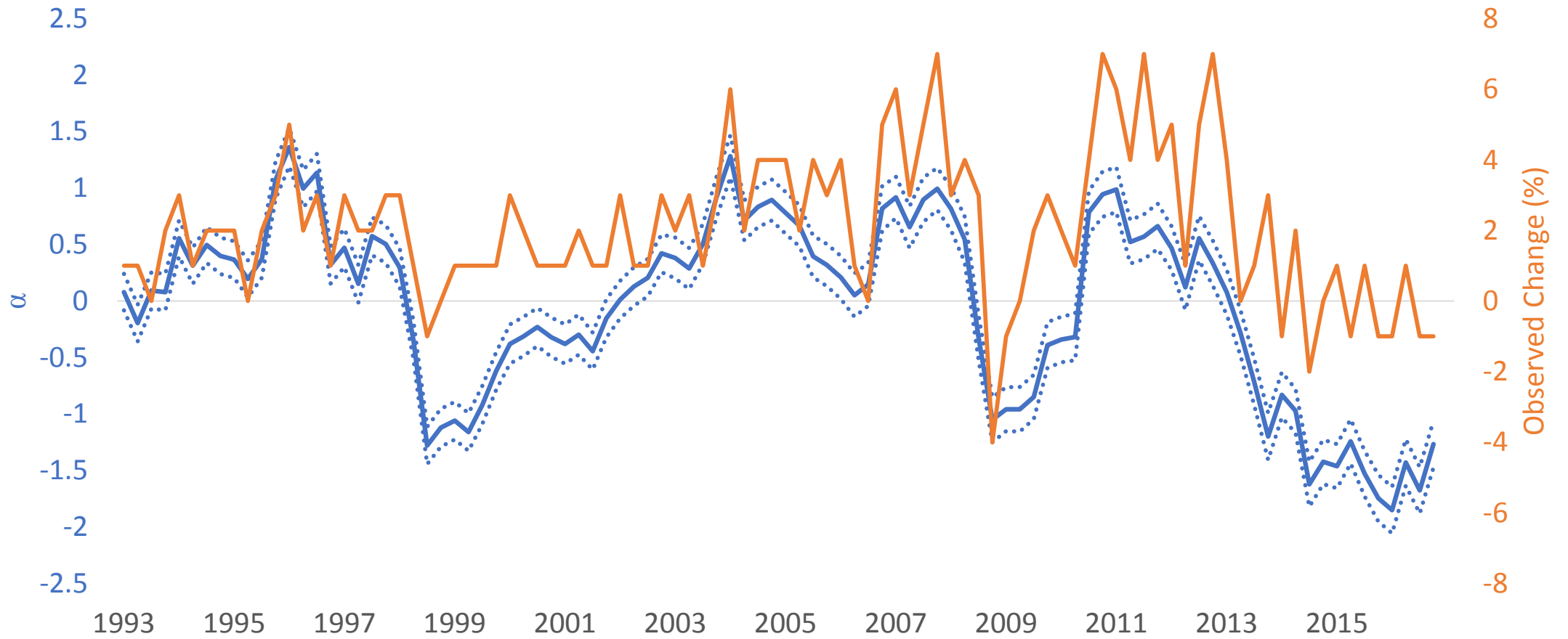
Preliminary Results



Preliminary Results



Preliminary Results



Future Research

- Evaluate alternative distributions (e.g., logit)
- Test for observed heterogeneity of respondents
 - Location
 - Bank attributes

Thank you