

# Statistics in a social context

## Opening remarks

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# Introduction

- Current debates:
  - Publication bias and p-hacking,
  - replicability and replications,
  - pre-analysis plans and other reform proposals, ...
- Motivation of this conference:
  - These debates raise a number of foundational questions,
  - which, I believe, are not well addressed by textbook frameworks,
  - and which require input from several disciplines.

# Roadmap

- Where I am coming from:
  1. Research with Isaiah Andrews on “which findings get published.”
  2. Research with Alex Frankel on “which findings should be published.”
- Three alternative perspectives on statistics:
  1. Decision problems,
  2. (optimal) communication,
  3. research as a social process.
- Brief preview of conference.

# Which findings get published?

Andrews, I. and Kasy, M. (2018). [Identification of and correction for publication bias](#)

## 1. **Published research is selected**

in various ways (significance at different levels, sign, ...)

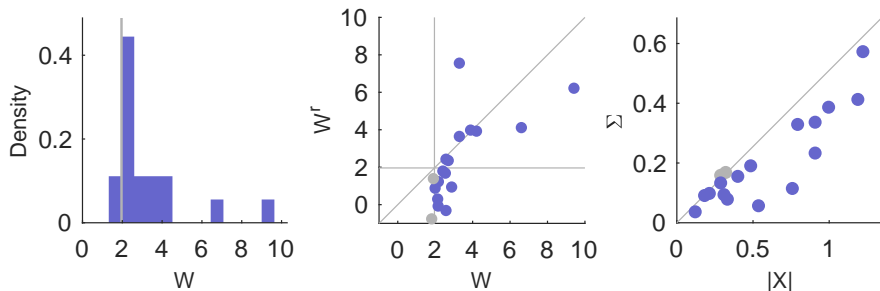
- Lab experiments in economics and psychology: Statistical significance
- Effect of minimum wages on employment: Statistical significance, sign.
- Deworming: Inconclusive.

## 2. How do we know?

Form and magnitude of **selection** are **nonparametrically identified**.

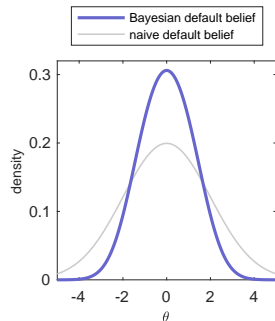
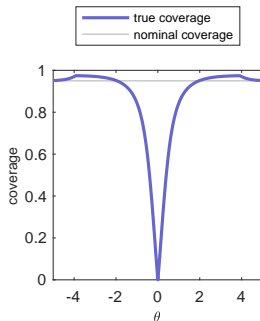
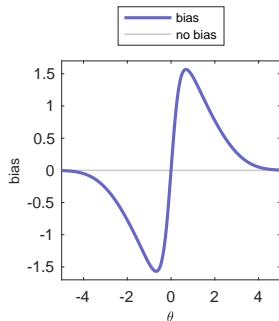
- Using systematic replication studies.
- Using meta-studies.

## Evidence on selective publication



- Data from systematic replication study of Camerer et al. (2016).
- Z-statistic  $W$ , replication  $W^r$ , estimate  $X$ , standard error  $\Sigma$ .
- Absent selection:
  1. z-statistics should be continuously distributed.
  2. Original and replication estimates should be symmetrically distributed.
  3. Estimates from studies with larger standard errors should be more dispersed, but not shifted.

# Selection implies publication bias



- Suppose only findings with z-stats  $> 1.96$  are published.
- The figures plot, as a function of the true mean  $\theta$ ,
  1. The bias of  $Z$  as estimator of  $\theta$ ,
  2. the coverage of  $Z \pm 1.96$  as confidence interval for  $\theta$ ,
  3. the naive and the correct Bayesian posterior density, for a normal prior, when no finding is published.

# Which findings should be published?

Frankel, A. and Kasy, M. (2018). Which findings should be published?

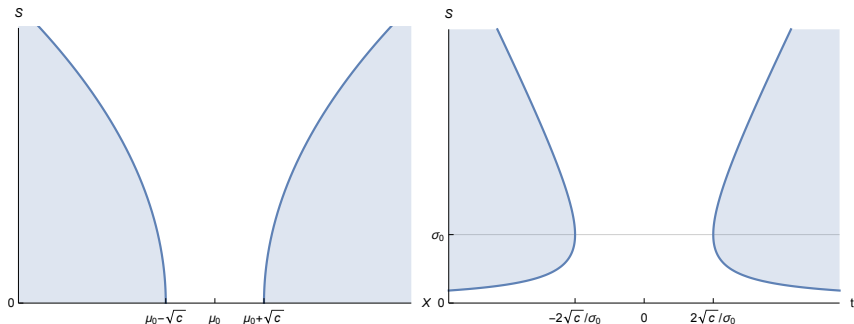
- Publication bias motivates calls for reform:  
Publication should not select on findings.
- But: Is eliminating bias the right objective?  
How does it relate to informing decision makers?
- We characterize **optimal publication rules from an instrumental perspective**:
  - Study might inform the public about some state of the world.
  - Then the public chooses a policy action.
  - Take as given that not all findings get published (prominently).

## Key findings

1. **Optimal** rules selectively **publish surprising findings**.  
In leading examples: Similar to two-sided or one sided tests.
2. But: Selective publication **always distorts inference**.  
There is a trade-off policy relevance vs. statistical credibility.

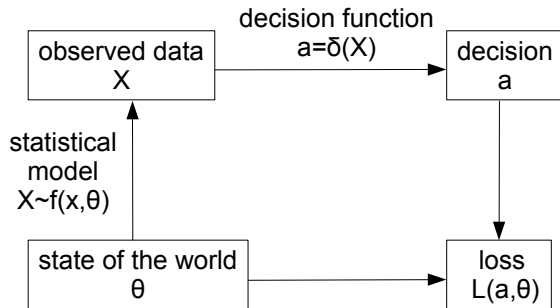


## Example of optimal publication region



- Optimal publication region (shaded). Axes:
  - left Estimate  $X$ , standard error  $S$ .
  - right “t-statistic”  $t = (X - \mu_0)/S$ , standard error  $S$ .
- Note:
  - Given  $S$ , publish outside symmetric interval around  $\mu_0$ .
  - Critical value for t-statistic is non-monotonic in  $S$ .

## A standard foundation of statistics: Decision theory



Questions to ask in this framework:

- Objective function?
- Set of feasible actions?
- Prior information?

# Is this an appropriate description of empirical research?

- Some questions:
  - Why do we not just print all the data?
  - Why do we need researchers?
  - What is the purpose of pre-committing to a research design?
  - Does commitment make sense without conflicts of interest?
  - How do we cumulatively learn from published research?
- Can we make sense of publication bias, pre-analysis plans, etc., using textbook foundations of statistics?
- Or do we need alternative foundations, taking into account the social dimension of research?

# Alternative foundations

Different ways of thinking about statistics / econometrics:

## 2. Statistics as (optimal) communication.

- Not just “you and the data.”
- What do we communicate to whom?
- Subject to what costs and benefits?  
Why not publish everything? Attention?

## 3. Statistics / research as a social process.

- Researchers, editors and referees, policymakers.
- Incentives, information, strategic behavior.
- Social learning, paradigm changes.

## Proposed agenda

- Derive **optimal methodological recommendations**,
- assuming the **goal** is to promote some notion of collective **learning through communication** of summaries of empirical findings,
- taking into account the **constraints** of human psychology and the social organization of research.

To better understand these constraints, draw on

1. psychology,
2. sociology and history of science,
3. microeconomic theory and information economics.

# Conference outline

- **Applied perspectives**

- Katherine Casey (development economics)  
*Comments on pre-specification and analysis plans*
- Simine Vazire (psychology) *The Credibility Revolution in Psychological Science*
- Ben Olken (development economics) *Promises and Perils of Pre-Analysis Plans*
- Daniel Mellow (meta studies)

- **Microeconomic models**

- Jann Spiess (econometrics)  
*Optimal Estimation when Researcher and Social Preferences are Misaligned*
- Alex Frankel (economic theory) *Which findings should be published*
- Isaiah Andrews (econometrics) *Statistical Reports for Remote Agents*
- Marco Ottaviani (economic theory) *Strategic Sample Selection*

- **Philosophical and historical perspectives**

- Theodore Porter (history of statistics) *Statistics, a Tool of Science?*
- Deborah Mayo (philosophy of statistics)  
*3D Statistics: 7 Responses to Challenges for Statistical Testers*
- Zoe Hitzig (economic theory, philosophy)  
*The Problem of New Evidence: P-hacking and Pre-analysis Plans*