JASP for Audit: Bayesian Tools for the Auditing Practice

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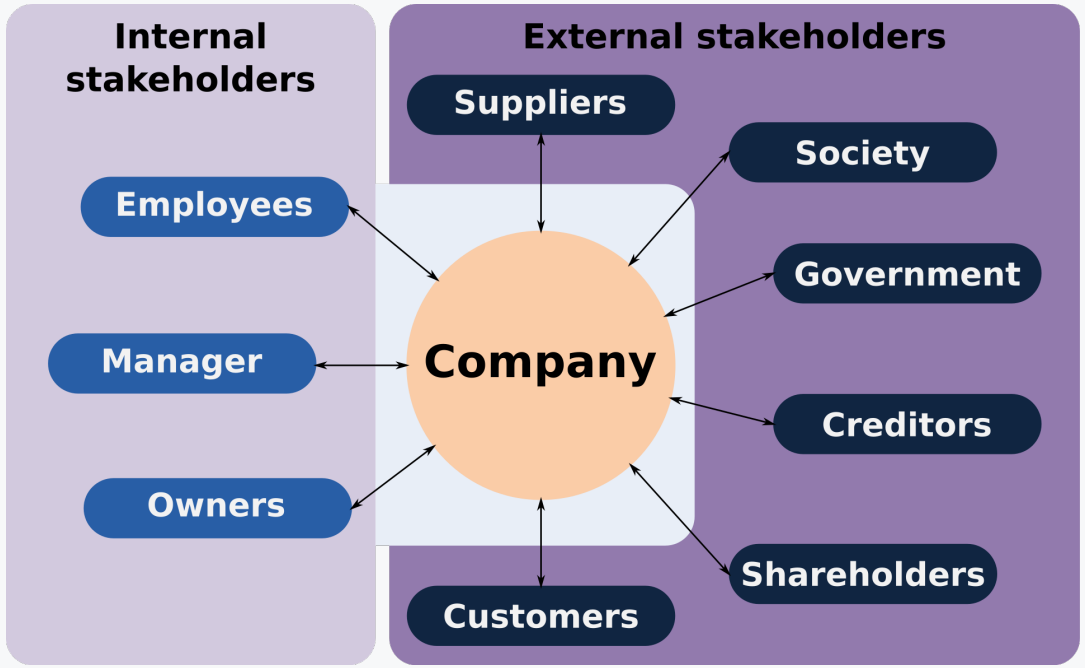
Friendly reminder: Why an audit?

An audit is a final check of an organization's financial statements and provides the auditors opinion on the fairness of these statements.



Source: https://en.wikipedia.org/wiki/Organizational_stakeholders#/media/File:Stakeholder_(en).svg

Statistical sampling in auditing

An organization's financial statements are large populations of observations that can contain thousands of transactions.

Two scenarios:

Inspecting the entire population

- 100% confidence in judgement
- Time consuming
- Expensive

Inspecting a sample of the population

- X% confidence in judgement
- Efficient

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Inspecting a sample of the population

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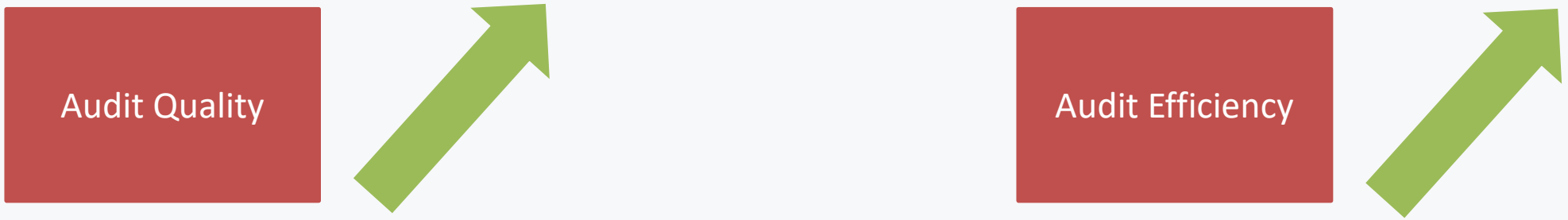
- Common practice

Problems in statistical sampling

Audit Quality	➢ Sampling is perceived as an error-prone and unpleasant job ➢ Misinterpretation of statistics, e.g., confidence intervals (Johnstone, 1997) ➢ Statistical knowledge is not a part of an auditors core expertise (Ramachandran Rackliffe et al., 1997)
Audit Efficiency	➢ Available expert knowledge is often not incorporated (Chesley, 1975) ➢ Available prior information is often disregarded
Audit Software	➢ Lack of closely connecting software (Kim et al., 2009) ➢ Closed-source packages (IDEA, ACL, TeamMate Analytics) ➢ Steep licensing costs

JASP for Audit: Goals

Create software that provides an easy-to-use, standardized workflow to guide auditors in performing statistical sampling, using state-of-the-art Bayesian techniques.



Solutions in statistical sampling

Audit Quality	➢ Assist auditors in their statistical inference by offering an easy-to-use, and understandable workflow ➢ Integrate audit theory and guidelines with audit software, preventing errors
Audit Efficiency	➢ Proposing a different view of statistical sampling that allows for incorporation of expert knowledge, and building upon existing knowledge ➢ Integrate these Bayesian methods with audit software
Audit Software	➢ Freely available, open-source, and easy-to-use statistical software ➢ Select the appropriate analysis, interprets the results, and produces a report ➢ Offer Bayesian statistics

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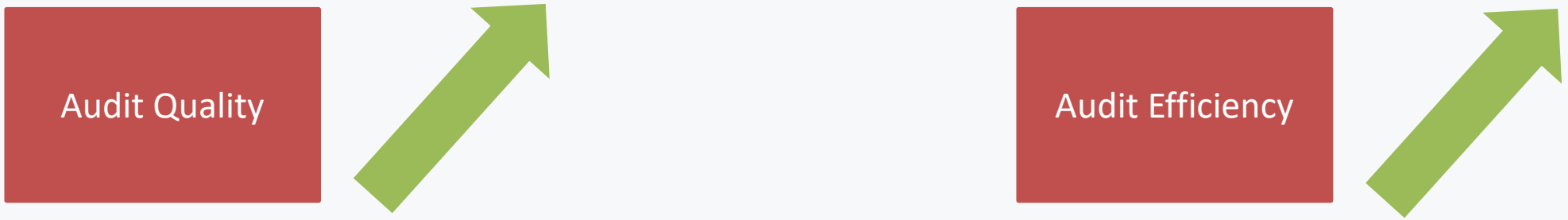
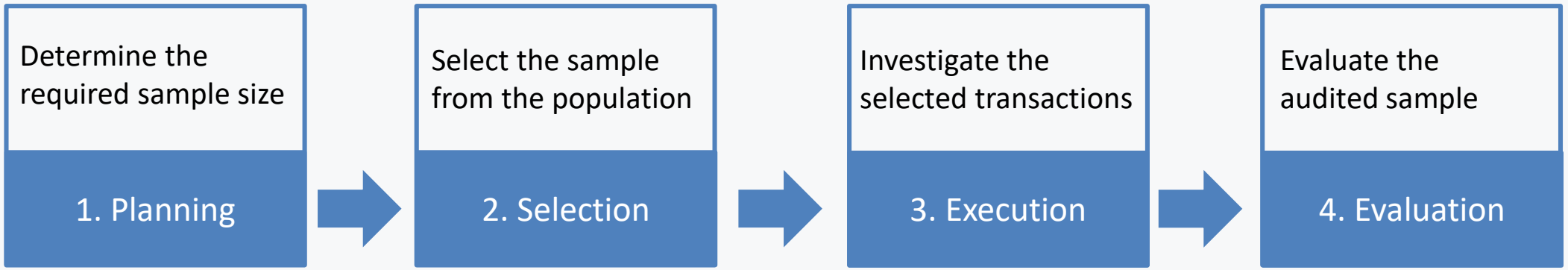
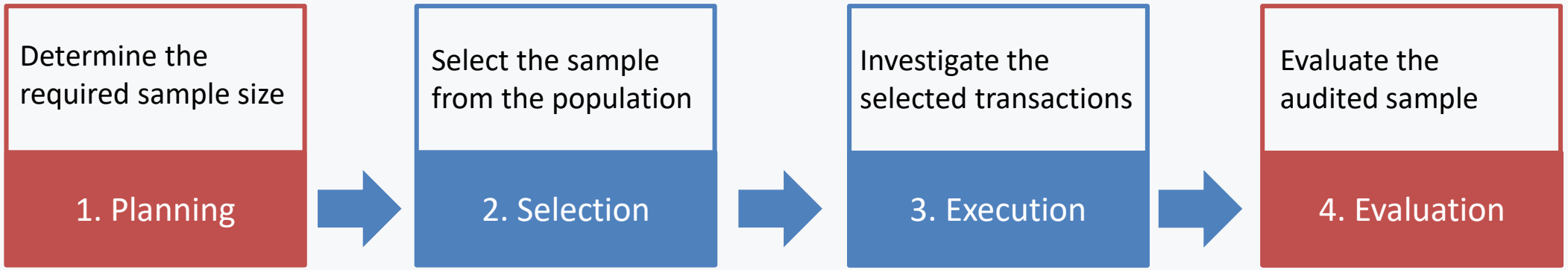


JASP for Audit: A standardized audit sampling workflow



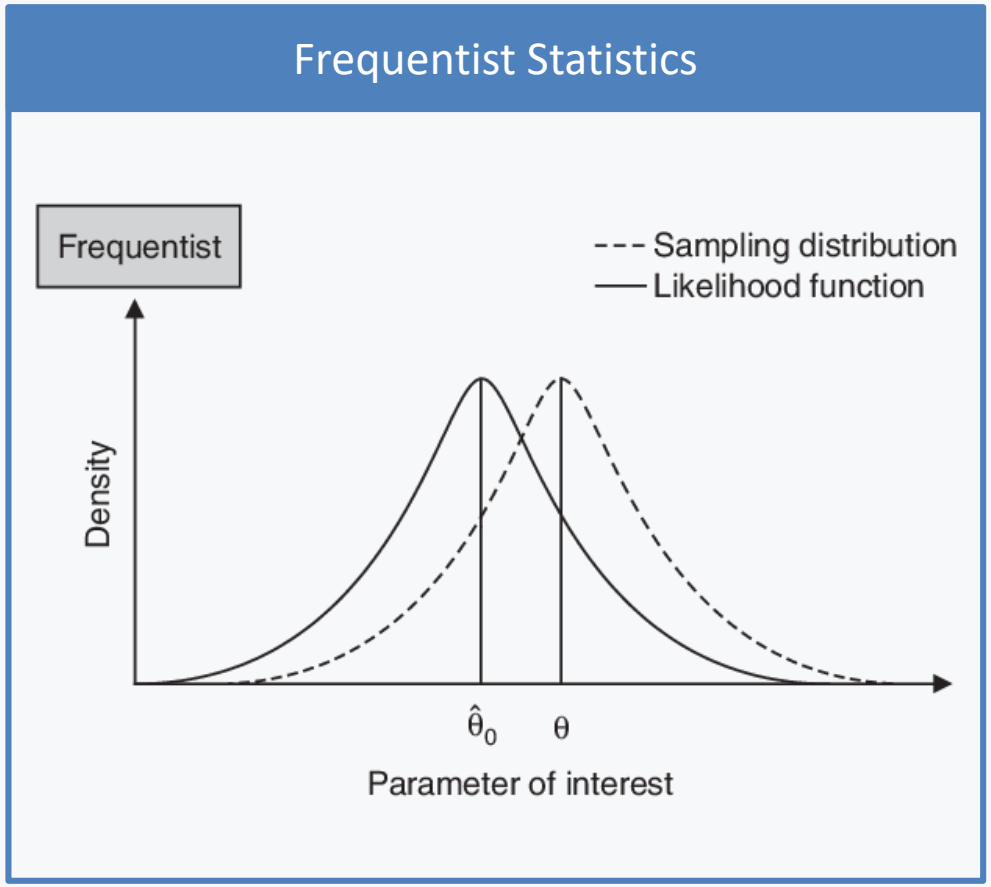
Easy-to-use and understandable software that guides the auditor through the statistical inference process.

JASP for Audit: A standardized audit sampling workflow



Easy-to-use and understandable software that guides the auditor through the statistical inference process.

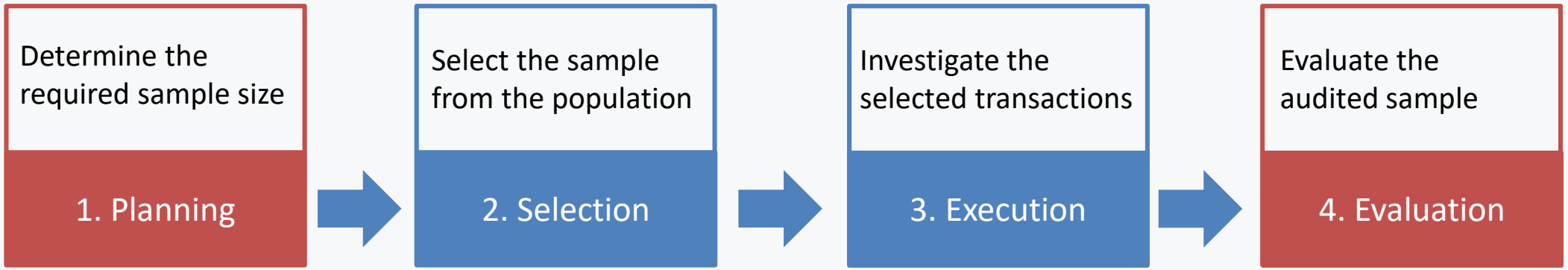
A frequentist perspective to audit sampling



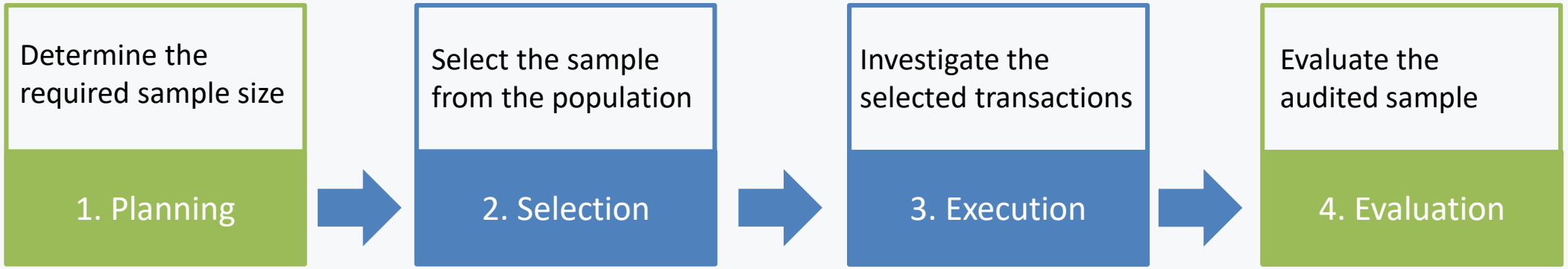
In the frequentist framework parameters (like the population misstatement θ) are fixed.

- Inferences are made with a type-I-error α, assuming a fixed parameter θ (e.g., 5% materiality)
- Incorporating existing information is done by increasing the type-I-error rate α, or lowering the confidence, directly impacting the sample size
- By definition this results in more erroneous conclusions (α%)

JASP for Audit: A standardized audit sampling workflow

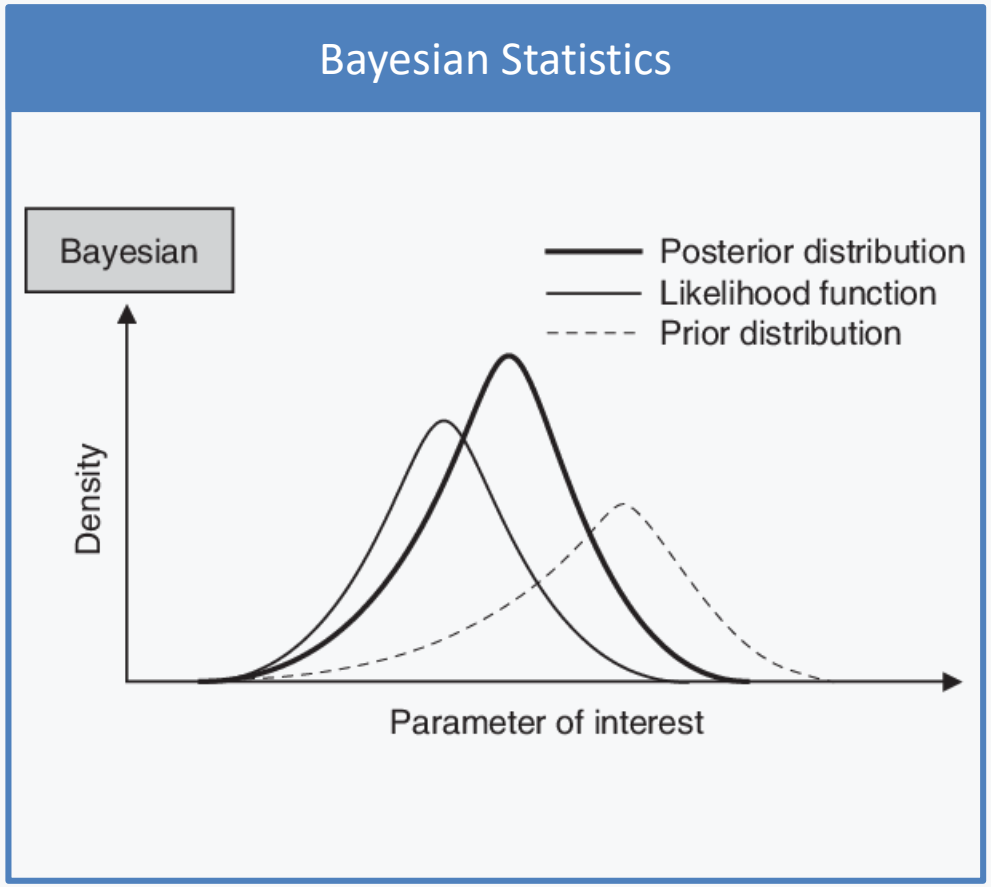


JASP for Audit: A standardized audit sampling workflow



Bayesian techniques that allow the auditor to accurately incorporate expert prior knowledge into their audit designs.

A Bayesian perspective to audit sampling



In the Bayesian framework, parameters themselves have uncertainty. The auditor is allowed to incorporate her information about θ into a prior probability distribution.

$$\underbrace{p(\theta \mid Data)}_{Posterior} \propto \underbrace{p(Data \mid \theta)}_{Likelihood} \times \underbrace{p(\theta)}_{Prior}$$

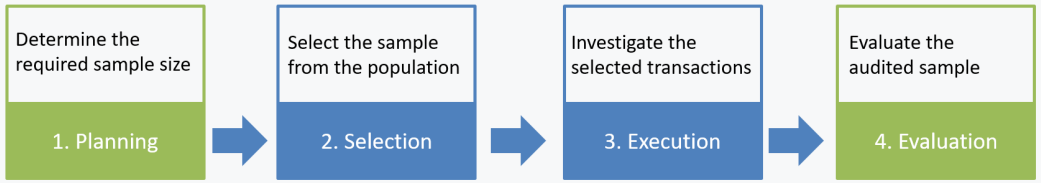
- The updated posterior is a weighted average of the prior and the information from the sample.
- Inferences are made with the original confidence.

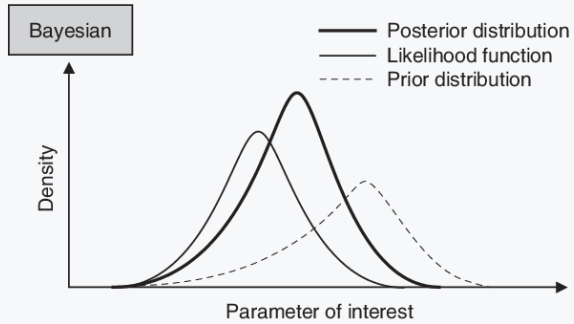
Bayesian benefits for auditing

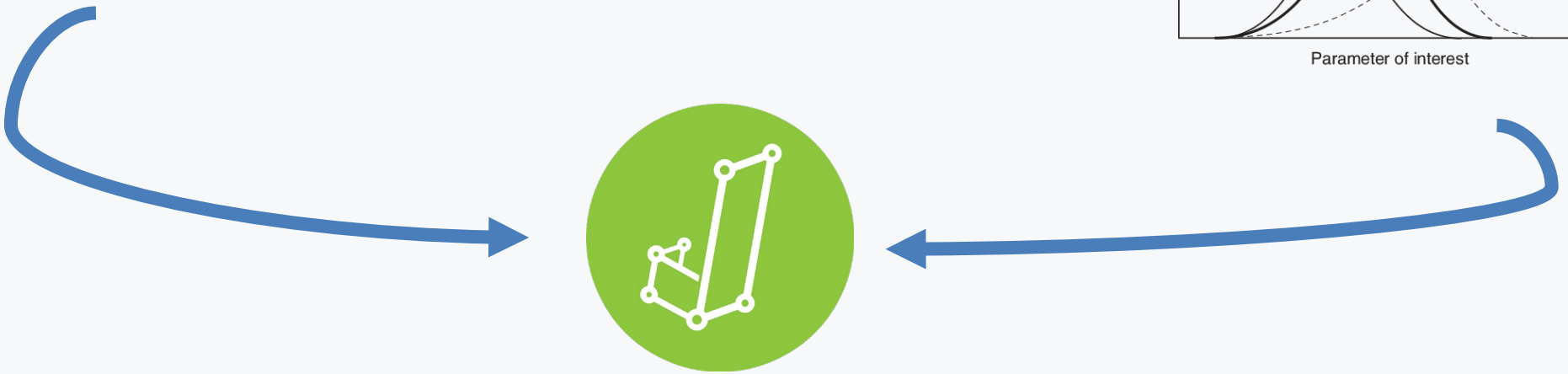
Bayesian statistics opens the door to many benefits that may increase audit quality and efficiency:

- Accurately quantifying existing knowledge by incorporating prior information
  - on the organization's control environment (de Swart, Wille & Majoor, 2013)
  - on the organization's audit results of last year (van Batenburg & Kriens, 1994)
  - from other expert assessments (for example Gronau, Ly & Wagenmakers (2019)
- Quantify the gradual strength of audit evidence for (in)tolerable misstatement
- More accurate estimation of the population misstatement
- Perform sequential analysis: Continue updating until a desired evidential threshold is reached

JASP for Audit (www.jasp-stats.org)







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Mind yourself, references are in Chicago style due to submission of the manuscript to the American Accounting Association.

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