THE JASP TEAM

STATISTICAL AUDITING WITH JASP

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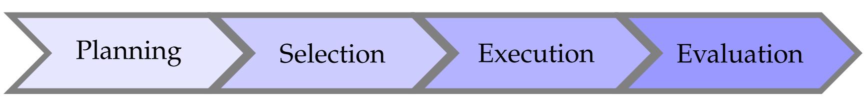
Introduction

Statistical theory lies at the core of many auditing guidelines and procedures. Consequently, an auditor needs easy-to-use software that implements the required statistical analyses as well as sufficient knowledge to interpret the results of these analyses. JASP is an open-source, free-of-charge, cross-platform statistical software program that facilitates auditing through the JASP for Audit (JfA) add-on module which is built to support the statistical aspects of an audit.

With JfA, you, the auditor, are able to plan, perform and interpret a substantive testing procedure using the correct statistical methods and without making any programming errors. The module is designed with the auditor in mind. This means that the interface is user-friendly and directly relates to audit processes and International Standards on Auditing. In order to create the most efficient experience for the auditor, JfA facilitates four stages of the audit workflow; *planning*, *selection*, *execution* and *evaluation*. In JfA's audit workflow, the auditor is guided through the audit process in terms of statistical choices and interpretation.



Next to the frequentist methods that currently dominate audit practice, JfA incorporates Bayesian counterparts of these methods that can improve the quality and efficiency of an audit. These Bayesian methods allow auditors to utilize the advantages of knowledge updating by accurately incorporating prior information.

In short, JfA performs all the required statistical heavy lifting and enables auditors to plan, evaluate and interpret their statistical analysis in terms of auditing standards and using state-of-the-art Bayesian and classical techniques.

A Fresh Way to Do Statistics

Figure 1: JASP is a free cross-platform statistical software program with a state-of-the-art graphical user interface. JASP can be downloaded at www.jasp-stats.org.

Figure 2: JASP for Audit (JfA) is a freely downloadable add-on module for JASP. JfA can be downloaded at www.jasp-stats.org/jfa.

Statistical Auditing Using the Audit Risk Model

Considering the size of audit populations, it would be enormously expensive to make an audit assertion with absolute certainty. Since the auditor cannot evaluate the total population of financial statements, but wants to make a population statement with a certain amount of confidence, statistical inference is a prerequisite. Recognizing this, the auditor defines a probability that he or she will provide an incorrect opinion on the population of financial statements, the **audit risk**. To correctly quantify the audit risk in terms of probability, the International Standards on Auditing consider the Audit Risk Model, which provides a mathematical association between the specified audit risk and the assessed risks of material misstatement.

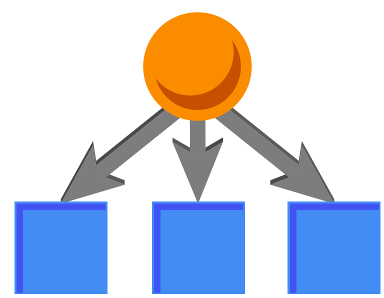


Figure 3: The Audit Risk Model partitions audit risk into inherent risk, control risk, and detection risk.

According to the Audit Risk Model, the audit risk as a whole can be divided into three constituents; inherent risk, control risk, and detection risk. **Inherent risk** is the risk posed by an error in a financial statement due to a factor other than a failure of internal controls. **Control risk** is defined as the probability that a material misstatement is not prevented or detected by the internal control systems of the company (e.g., computer managed databases). Both these risks and are commonly assessed by the auditor on a 3-point scale consisting of the categories low, medium, and high. JfA numerically translates these categories to probabilities of respectively 50%, 60% and 100% according to the Dutch IODAD standard [1]. **Detection risk** is the probability that an auditor will fail to find material misstatements that exist in an organization's financial statements. For a given level of audit risk, the tolerable level of detection risk bears an inverse relationship to the other two assessed risks. Intuitively, a greater risk of material misstatement should require a lower tolerable detection risk and, accordingly, requires more persuasive audit evidence [2].

[1] IODAD (2007). *Handboek Auditing Rijksoverheid 2007, vastgesteld door het Interdepartementaal Overlegorgaan Departementale Accountantsdiensten (IODAD) op 28 maart 2006 en 29 mei 2007.*

[2] IFAC (2018). International standard on auditing 200: Overall objectives of the independent auditor and the conduct of an audit in accordance with international standards on auditing

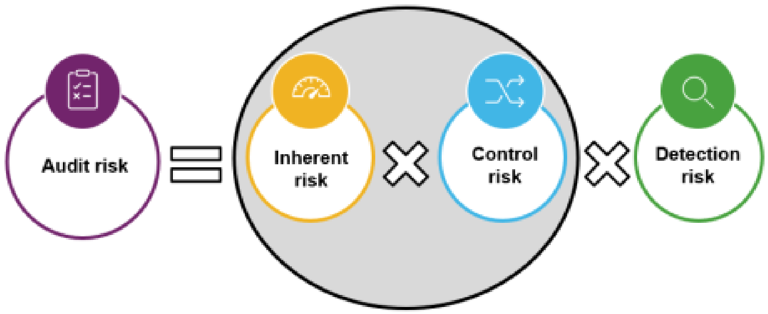


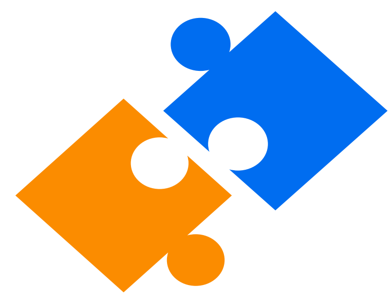
Figure 4: For a given level of audit risk, the tolerable level of detection risk bears an inverse relationship to the other two assessed risks.

The Audit Risk Model is practically useful, as it provides a statistical framework to increase or decrease the amount of audit evidence required from the auditor. For example, having found that the control risk of an organization is medium (60%) the auditor can increase the detection risk from 5% to 8.33%. When both inherent— and control risk are set to high (100%), the detection risk is not adjusted and equals the audit risk. For a conservative analysis, the auditor can therefore ignore the ARM in its totality.

Using the Audit Risk Model the auditor determines the required detection risk to maintain a specified audit risk, given the assessments of the inherent and control risk. The detection risk must be statistically substantiated by the auditor. Therefore, the auditor must audit a subset of the organization's statements large enough that, when a certain number of expected errors are found, the auditor can conclude with the specified statistical certainty that he or she did not fail to find material misstatements in the total population.

The Audit Workflow

JfA transforms the audit process into a standard workflow in which you as an auditor can plan the size of your required subset, select the required observations, perform your audit and make a statement about whether or not your population of interest contains material misstatement. JfA's workflow consists of four stages, *planning*, *selection*, *execution* and *evaluation*.



Planning

Substantive testing starts with the planning stage. Here, the auditor uses the knowledge that is gathered during earlier portions of the audit to determine an appropriate sample size for supporting the assertion that the misstatement in the population is lower than materiality. This knowledge consists of information about the organization's operational field and quality of the organization's internal control mechanisms, which can be used to adjust the amount of evidence that is needed to approve the financial statements. Furthermore, the auditor often has an expectation of the amount of errors that will be found. These factors affect how many observations needs to be evaluated by the auditor.

Selection

The auditor uses the calculated sample size from the planning stage as an input for the selection stage. In statistical selection all possible sampling units receive an inclusion probability. Units are then selected from the population with a probability equal to the inclusion probability until the required sample size has been reached. The nature of the sampling units is dependent on the sampling type. The most commonly used sampling method for substantive tests is monetary unit sampling. In monetary unit sampling, probabilities are assigned on the level of individual monetary units. For example, a monetary unit sampling procedure may consider each individual dollar in the population as a sampling unit. In monetary unit sampling, when a monetary unit is selected for the subset, the observation that corresponds to that unique monetary unit is selected. As such, a transaction of $5,000 is five times more likely to be selected than a transaction of $1,000. In record sampling, probabilities are assigned on the observation level, resulting in equal inclusion probabilities for all observations.

Execution

In this phase, the auditor will assess the fairness of the selected observations by looking at the degree of correctness. An auditor can choose to do this in one of two ways. The most straightforward method considers the observations to be correct or incorrect. This method does not consider that observations can be partially over- or understated, and therefore results in a more conservative estimate of the total error. A more common method considers the true market value (audit value) of the observations. In this method, information about the size of the error proportional to the size of the transaction is retained. Annotating the selection with the latter technique has preference over the former, as estimation of the total error with audit values is more accurate and less conservative. The nature of the audit population determines the manner of annotation. If the auditor wishes to make a statement on the amount of misstatement, it is common practice to annotate one's selection with the audit values. If the auditor does not have access to book values, the preferred annotation method is the binary method. The auditor exits this stage with an annotated subset of the population. The choice of evaluation mechanism, sampling type, and sampling method, are leading in the choice of a statistical evaluation mechanism for inferring misstatement in the population.

Evaluation

The evaluation phase is the final stage of the workflow. Here, the auditor uses the annotated sample from the execution stage to make a well-substantiated inference about the total error in the population of financial statements. To this aim the auditor uses statistical techniques to calculate the projected maximum error. The auditor approves the population when this maximum error is below the limit of materiality.

Frequentist Auditing

The frequentist approach to auditing models the misstatement in an audit population using a probability distribution with a fixed error rate parameter, the materiality. The presumption is that this parameter is true and that all observed data is sampled from the corresponding distribution. Consequently, the $(1 - \alpha)\%$ confidence estimate of the misstatement is solely based on the likelihood of that distribution.

A Frequentist Walkthrough of the Audit Workflow

Bayesian Auditing

The Bayesian approach models the prior uncertainty about the misstatement in an audit population by a probability distribution over possible its possible values. Using the available information in the data, this prior distribution is transformed by into a posterior distribution by means of Bayes theorem. Consequently, the estimate of the maximum error is based on the prior distribution and the likelihood of the data. One's ability to draw confident inferences depends on one's degree of confidence in the chosen prior distribution, and the robustness of the findings to alternate prior distributions. The subjective nature of the prior distribution is a critique of Bayesian inference. However, even though the prior may be subjective, one can specify the logical assumptions used to arrive at it, which allows other people to challenge it or try other priors.

A Bayesian Walkthrough of the Audit Workflow

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