

University of Groningen

Statistical Auditing and the AOQL-method

Talens, Erik

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version

Publisher's PDF, also known as Version of record

Publication date:

2005

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Talens, E. (2005). *Statistical Auditing and the AOQL-method*. s.n.

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Bibliography

- Arens, A.A. and J.K. Loebbecke (1997), *Auditing An Integrated Approach*, 7 edn, Prentice-Hall, New Jersey.
- Arkin, H. (1974), *Handbook of Sampling for Auditing and Accounting*, 2 edn, Mc Graw Hill, New York.
- Bentkus, V. and M. Van Zuijlen (2001), Upper confidence bounds for the mean, Technical Report 0110, University of Nijmegen.
- Bickel, P.J. (1992), 'Inference and auditing: the Stringer bound', *International Statistical Review* **60**, 197–209.
- Bickel, P.J. and K.A. Doksum (1977), *Mathematical Statistics: Basic Ideas and Selected Topics*, Holden-Day, San Fransisco.
- Blaker, H. and E. Spjøtvoll (2000), 'Paradoxes and improvements in interval estimation', *The American Statistician* **54**, 242–247.
- Blyth, C.R. and H. Still (1983), 'Binomial confidence intervals', *Journal of the American Statistical Association* **78**, 108–116.
- Buonaccorsi, J.P. (1987), 'A note on confidence intervals for proportions in finite populations', *The American Statistician* **41**, 215–218.
- Casella, G. and C. Robert (1989), 'Refining Poisson confidence intervals', *Canadian Journal of Statistics* **17**, 45–57.
- Clopper, C.J. and E.S. Pearson (1934), 'The use of confidence or fiducial limits illustrated in the case of the binomial', *Biometrika* **26**, 404–413.
- Cochran, W.G. (1977), *Sampling Techniques*, 3 edn, John Wiley, New York.
- Cox, D.R. and E.J. Snell (1979), 'On sampling and the estimation of rare errors', *Biometrika* **66**, 125–132.

- Crow, E.L. and R.S. Gardner (1959), 'Confidence intervals for the expectation of a Poisson variable', *Biometrika* **46**, 441–453.
- Cyert, R.M. and H.J. Davidson (1962), *Statistical Sampling for Accounting Information*, Prentice Hall, Englewood Cliffs.
- Davidson, R.R. and B.R. Johnson (1993), 'Interchanging parameters of the hypergeometric distribution', *Mathematics Magazine* **66**, 328–329.
- De Koning, F. (2004), 'Bestuurlijke informatieverzorging of interne beheersing', *Maandblad voor Accountancy en Bedrijfseconomie* **7/8**, 343–347.
- Deming, W.E. (1991), *Out of the Crisis*, 12 edn, Massachusetts Institute of Technology, Cambridge.
- Dodge, H.F. and H.G. Romig (1959), *Sampling Inspection Tables*, 2 edn, John Wiley, New York.
- Dworin, L. and R.A. Grimlund (1984), 'Dollar unit sampling for accounts receivable and inventory', *The Accounting Review* **59**, 218–241.
- Emanuel, J., O. Van Leeuwen and P. Wallage (2004), 'Internal control volgens Sarbanes-Oxley', *Maandblad voor Accountancy en Bedrijfseconomie* **7/8**, 348–355.
- Fang, K.T. and Y. Zhang (1990), *Generalized multivariate analysis*, Springer-Verlag, Berlin.
- Felix, W.L. and R.A. Grimlund (1977), 'Sampling model for audit tests of composite accounts', *Journal of Accounting Research* **15**, 23–42.
- Fienberg, E.F., J. Neter and R.A. Leitch (1977), 'Estimating the total overstatement error in accounting populations', *Journal of the American Statistical Association* **72**, 295–302.
- Fisher, W.D. (1958), 'On grouping for maximum homogeneity', *Journal of the American Statistical Association* **53**, 789–798.
- Frost, P.A. and H. Tamura (1982), 'Jackknifed ratio estimation in statistical auditing', *Journal of Accounting Research* **20**, 103–120.
- Frost, P.A. and H. Tamura (1986), 'Accuracy of auxiliary information interval estimation in statistical auditing', *Journal of Accounting Research* **24**, 57–75.
- Ghosh, B.K. (1970), *Sequential Tests of Statistical Hypotheses*, Addison-Wesley Publishing Company, Reading.

- Grimlund, R.A. and M.S. Schroeder (1988), 'On the current use of the Stringer method for mus: Some new directions', *Auditing: A Journal of Practice & Theory* **8**, 53–62.
- Helmers, R. (2000), 'Inference on rare errors using asymptotic expansions and bootstrap calibration', *Biometrika* **87**, 689–694.
- Hoeffding, W. (1956), 'On the distribution of the number of successes in independent trials', *The Annals of Mathematical Statistics* **27**, 713–721.
- Hoeffding, W. (1963), 'Probability inequalities for sums of bounded random variables', *Journal of the American Statistical Association* **58**, 13–30.
- Howard, R.C. (1994), 'A combined bound for errors in auditing based on Hoeffding's inequality and the bootstrap', *Journal of Business & Economic Statistics* **12**, 437–447.
- IMSL libraries* (1984), Houston, Texas: IMSL.
- Johnson, J.R., R.A. Leitch and J. Neter (1981), 'Characteristics of errors in accounts receivable and inventory audits', *The Accounting Review* **56**, 270–293.
- Johnson, N.L., S Kotz and A.W. Kemp (1992), *Univariate Discrete Distributions*, 2 edn, John Wiley, New York.
- Johnstone, D.J. (1997), 'Comparative classical and Bayesian interpretations of statistical compliance tests in auditing', *Accounting and Business Research* **28**, 53–82.
- Kabaila, P. and J. Byrne (2001), 'Exact short Poisson confidence intervals', *Canadian Journal of Statistics* **29**, 99–106.
- Katz, L. (1953), 'Confidence intervals for the number showing a certain characteristic in a population when sampling is without replacement', *Journal of the American Statistical Association* **48**, 256–261.
- Klaassen, C.A.J. (2001), 'Credit in acceptance sampling on attributes', *Technometrics* **43**, 212–222.
- Kleijnen, J.P.C., J. Kriens, H. Timmermans and H. Van den Wildenberg (1988), *Regression sampling in statistical auditing*, FEW 306, University of Tilburg.
- Kleijnen, J.P.C., J. Kriens, M.C.H.M. Laffleur and J.H.F. Pardoel (1992), 'Sampling for quality inspection and correction: AOQL performance criteria', *European Journal of Operational Research* **62**, 372–379.

- Konijn, H.S. (1973), *Statistical Theory of Sample Survey Design and Analysis*, North-Holland, Amsterdam.
- Kriens, J. (1988), Statistical sampling in auditing and accounting, Technical Report 340.90.095, University of Tilburg.
- Kriens, J. and A.C. Dekkers (1979), *Steekproeven in de Accountantscontrole*, Stenfert Kroese, Leiden.
- Laws, D.J. and A. O'Hagan (2000), 'Bayesian inference for rare errors in populations with unequal unit sizes', *Applied Statistics* **49**, 577–590.
- Laws, D.J. and A. O'Hagan (2002), 'A hierarchical Bayes model for multilocation auditing', *The Statistician* **51**, 431–450.
- Leemis, L.M. and S.T. Kishor (1996), 'A comparison of approximate interval estimators for the Bernoulli parameter', *The American Statistician* **50**, 63–68.
- Leitch, R.A., J. Neter, R. Plante and P. Sinha (1982), 'Modified multinomial bounds for larger numbers of errors in audits', *The Accounting Review* **57**, 384–400.
- Leslie, D.A., A.D. Teitlebaum and R.J. Anderson (1980), *Dollar Unit Sampling: A Practical Guide for Auditors*, Pitman, London.
- Lieberman, G.J. and D.B. Owen (1961), *Tables of the Hypergeometric Probability Distribution*, Stanford University Press, Stanford.
- Ling, R.F. and J.W. Pratt (1984), 'The accuracy of Peizer approximations to the hypergeometric distribution with comparisons to some other approximations', *Journal of the American Statistical Association* **79**, 49–60.
- Lucassen, A., J.J.A. Moors and P.C. Van Batenburg (1996), 'Modifications of the Stringer-bound: a simulation study on the performance of audit sampling evaluation methods', *Kwantitatieve Methoden* **51**, 17–25.
- Matsumura, E.M., K.W. Tsui and W.K. Wong (1990), 'An extended multinomial-Dirichlet model for error bounds for dollar-unit sampling', *Contemporary Accounting Research* **6**, 485–500.
- Matsumura, E.M., R. Plante, K.W. Tsui and P. Kannan (1991), 'Comparative performance of two multinomial-based methods for obtaining lower bounds on the total overstatement error in accounting populations', *Journal of Business & Economic Statistics* **9**, 423–429.

- McGray, J.H. (1984), 'A quasi-Bayesian audit risk model for dollar unit sampling', *The Accounting Review* **59**, 35–51.
- Meeden, G. (2003), 'A Bayesian solution for a statistical auditing problem', *Journal of the American Statistical Association* **98**, 735–740.
- Meikle, G.R. (1972), *Statistical Sampling in an Audit Context*, Canadian Institute of Chartered Accountants, Toronto.
- Menzefricke, U. and W. Smieliauskas (1984), 'A simulation study of the performance of parametric dollar unit sampling statistical procedures', *Journal of Accounting Research* **22**, 588–603.
- Molenaar, W. (1973), 'Simple approximations to the Poisson, binomial, and hypergeometric distributions', *Biometrics* **29**, 403–408.
- Moors, J.J.A. (2000), 'Repeated audit controls', *Statistica Neerlandica* **54**, 3–13.
- Neter, J. and J. Godfrey (1985), 'Robust Bayesian bounds for monetary unit sampling in auditing', *Applied Statistics* **34**, 157–168.
- Neter, J., R.A. Leitch and E.F. Fienberg (1978), 'Dollar unit sampling: Multinomial bounds for total overstatement and understatement errors', *The Accounting Review* **53**, 77–93.
- Newcombe, R.G. (1998), 'Two-sided confidence intervals for the single proportion: Comparison of seven methods', *Statistics in Medicine* **17**, 857–872.
- Panel on Nonstandard Mixtures of Distributions (1989), 'Statistical models and analysis in auditing', *Statistical Science* **4**, 2–33.
- Pap, G. and M.C.A. Van Zuijlen (1996), 'On the asymptotic behaviour of the Stringer bound', *Statistica Neerlandica* **50**, 367–389.
- Plante, R., J. Neter and R.A. Leitch (1984), 'A lower multinomial bound for the total overstatement error in accounting populations', *Management Science* **30**, 37–50.
- Plante, R., J. Neter and R.A. Leitch (1985), 'Comparative performance of multinomial, cell, and Stringer bounds', *Auditing: A Journal of Practice & Theory* **5**, 40–56.
- Raats, V.M. and J.J.A. Moors (2000), Double checking for two error types, CDP 2000-120, University of Tilburg.
- Raats, V.M. and J.J.A. Moors (2004), 'Double checking auditors: a Bayesian approach', *The Statistician* **52**, 1–15.

- Reneau, J.H. (1987), 'C.A.V. bounds in dollar unit sampling: some simulation results', *The Accounting Review* **3**, 669–680.
- Rohrbach, K.J. (1993), 'Variance augmentation to achieve nominal coverage probability in sampling from audit populations', *Auditing: A Journal of Practice & Theory* **12**, 79–97.
- Ryan, T.P. (1989), *Statistical Methods for Quality Improvement*, John Wiley, New York.
- Schader, M. and F. Schmid (1992), 'Two rules of thumb for the approximation of the binomial distribution by the normal distribution', *The American Statistician* **46**, 53–54.
- Schilder, A, J.C.A. Gortemaker, J.A. Van Manen and J. Waardenburg (1998), *Moderne Accountantscontrole*, 2 edn, Academic Service, Schoonhoven.
- Simons, A.J., P.C. Van Batenburg and J. Kriens (1989), Statistische kwaliteitscontrole met behulp van de EOQL-methode: een herziene en verbeterde versie van de AOQL-methode, Technical Report 89.01, University of Tilburg.
- Steele, A. (1992), *Audit Risk and Audit Evidence*, Academic Press, London.
- Stringer, K.W. (1963), Practical aspects of statistical sampling in auditing, in 'Proceedings of the Business and Economics Section', American Statistical Association, pp. 405–411.
- Swinamer, K., M. Lesperance and H. Will (2004), 'Optimal bounds used in dollar-unit sampling: A comparison of reliability and efficiency', *Communications in Statistics* **33**, 109–143.
- Talens, E. (1998), Statistical auditing, Master's thesis in Statistics, University of Groningen.
- Tamura, H. (1988), 'Estimation of rare errors using expert judgement', *Biometrika* **75**, 1–9.
- Tamura, H. and P.A. Frost (1986), 'Tightening CAV (DUS) bounds by using a parametric model', *Journal of Accounting Research* **24**, 364–371.
- Tsui, K.W., E.M. Matsumura and K.L. Tsui (1985), 'Multinomial-Dirichlet bounds for dollar-unit sampling in auditing', *The Accounting Review* **60**, 76–96.
- Van Batenburg, P.C. and J. Kriens (1988), E.O.Q.L. - a revised and improved version of A.O.Q.L., FEW 348, University of Tilburg.

- Van Heerden, A. (1961), 'Steekproeven als middel van accountantscontroles', *MAB* **11**, 453.
- Van Manen, J.A. (1990), *Harde en zachte cijfers, Rede aanvaarding ambt van hoogleraar*, University of Groningen.
- Vännman, K. (1995), 'On the distribution of the estimated mean from nonstandard mixtures of distributions', *Communications in Statistics* **24**, 1569–1584.
- Veenstra, R.H. and J. Kriens (1982), 'Toepassen van steekproeven in de administratie en de interne controle door middel van het AOQL-systeem', *Bedrijfskunde* **54**, 252–262.
- Vollset, S.E. (1993), 'Confidence intervals for a binomial proportion', *Statistics in Medicine* **12**, 809–824.
- Wendell, J.P and J. Schmee (1996), 'Exact inference for proportions from a stratified finite population', *Journal of the American Statistical Association* **91**, 825–830.
- Wendell, J.P. and J. Schmee (2001), 'Likelihood confidence intervals for proportions in finite populations', *The American Statistician* **55**, 55–61.
- Wetherill, G.B. and D.W. Brown (1991), *Statistical process control: theory and practice*, Chapman and Hall, London.
- Wille, F.J. (2003), *Auditing using Bayesian decision analysis*, PhD thesis, Vrije Universiteit Amsterdam.
- Wright, T. (1991), *Exact Confidence Bounds When Sampling From Small Finite Universes*, Springer-Verlag, New York.
- Wright, T. (1997), 'A simple algorithm for tighter exact upper confidence bounds with rare attributes in finite universes', *Statistics and Probability Letters* **36**, 59–67.
- Wu, T. (1993), 'An accurate computation of the hypergeometric distribution function', *ACM Transactions on Mathematical Software* **19**, 33–43.

