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ScienceDirect
Journal of Accounting and Public Policy 26 (2007) 621–633
Journal of Accounting and Public Policy
www.elsevier.com/locate/jaccpubpol

General theory of cost minimization strategies of continuous audit of databases

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Abstract

The minimization of cost is an important issue in the domain of continuous auditing (CA) research [Pathak Jagdish, Chaouch Ben, Sriram Ram, 2005. Minimizing cost of continuous audit: Counting and time dependent strategies. Journal of Accounting and Public Policy 24(1), 61–75]. This cited study of continuous audit of databases motivated us to work further and provide a general, complete and precise solution. In the present study, we propose an efficient algorithm in terms of long term cost for counting and periodic strategies of continuous auditing as suggested by Pathak et al. study. The improved algorithms contribute to accounting literature in general and continuous audit in particular in the form of general theory proposed for minimizing the cost of CA of databases.

Keywords: Continuous audit; Minimization of cost; Database auditing

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0278-4254/$ - see front matter
doi:10.1016/j.jaccpubpol.2007.08.005

1. Introduction and motivation

The minimizing the cost of continuous audit (CA) was studied by Pathak et al. (2005), hereafter referred to as PCS, and by Orman (2001). PCS suggest an algorithm for minimizing the cost of continuous audit under more general assumptions than Orman (2001). Also, note that the PCS algorithms involve the solution of a linear inhomogeneous[1] difference equation of infinite order. However, the analysis made in PCS is only based on a particular solution and that is an incomplete solution since it ignores the corresponding homogeneous solution. Thus, the main contribution of this paper is to provide a complete and accurate solution in the form of general theory for the problem suggested in the PCS study.

We propose to improve the algorithms suggested by PCS and also, relax an assumption concerning the independence of validation time process. Thus, we assume the possible dependence structure among successive transactions. Except for this assumption, the other assumptions are the same as given in PCS. The PCS analytical model identifies the optimal number of transactions after which audit must begin under the counting strategy and the optimal time that must elapse before audit must begin under the periodic strategy.

The remainder of this paper is organized as follows. Sections 2 and 3 contain the proposed models for both the strategies as identified in PCS paper. In both sections, we establish new and complete solutions and present an analytical comparison with respect to the PCS results. We provide a numerical example in Section 4 to illustrate the proposed algorithms. Finally, in Section 5, we conclude our study with contributions.

2. Analytical model for counting strategy

As explained in PCS (2005), counting strategy requires that a "database is monitored for errors and other integrity violations after every n transaction. A transaction for this purpose would include input, deletion, or modification of one or more of the records within a database. One of the critical requirements of counting strategy is the selection of n, the number of transactions after which a database must be monitored for integrity violations".

Let C be the cycle time (time elapsed between two consecutive audit periods). Let C_1 be the time it takes to audit n transactions and the transactions that arrived on line during the audit period. Also, let C_2 be the time that elapses before audit starts again when no audit is conducted. Also, as in PCS, we

[1] Some mathematical texts also use "complete difference equations" in place of "inhomogeneous difference equations".