Quantum information and accounting information: Their salient features and conceptual applications

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Abstract

In an interdisciplinary effort, we explore the field of quantum information to search for promising conceptual applications to accounting. Salient features of quantum information are reviewed along with methods associated with the discipline. We then draw parallels to double-entry information through a discussion of the work of mathematician Arthur Cayley. We note that accounting information is a broader concept than double-entry information, and we identify some conceptual applications of quantum information to accounting, aiming to integrate the measurement process and its interactions with the environment.
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0. Introduction

In this paper, we examine the nature of quantum information in order to search for promising conceptual applications to accounting.[1] In recent years, there has been much attention in physics to the application of quantum mechanics to information processing as opposed to just its intrinsic properties. We wish to take this one step further and seek a connection between quantum information and accounting information.[2]

To link accounting information with quantum information, it is necessary to review the salient features and research emphasis of quantum information. In Section 1, we introduce important features of quantum information, such as quantum superposition, randomness, entanglement, and unbreakable cryptography. We then selectively discuss the research methods and research emphasis in quantum information and speculate on useful possibilities in accounting. In particular, we conclude important lessons can be derived from quantum information's attention to the fundamental laws of the discipline, consistency with past principles, causality of events, and ways to cope with a paradigm shift.

We start to explore the possible link between quantum information and double-entry information in Section 2. Double-entry information lies in the core of accounting information. It emphasizes connectivity and causality. A generic linkage is established through a discussion of the work of nineteenth century mathematician Arthur Cayley. He developed important mathematical concepts, such as matrix algebra, that later became indispensable for quantum mechanics. In addition, Cayley wrote a small booklet on double-entry bookkeeping and praised the system embedded in double-entry bookkeeping as an ''absolutely perfect one''. We describe the parallels made by Cayley between Euclid's ratio theory and double-entry theory and conclude Cayley was able to give such high praise to accounting because of the isomorphism he saw between the ''ratio matrix'' and the ''double-entry matrix''. The feasibility of a hybrid, ''quantum double-entry information'', is also briefly explored.

Accounting information, in our point of view, is a broader concept than double-entry information. In Section 3, we emphasize its endogeneity including recognition and aggregation issues. The measurement school and the information content school are contrasted and critically analyzed from both physical and social perspectives. Some conceptual applications of quantum information

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[1] Here, we are using the term ''information'' broadly to include ''computation'', except where the latter term fits in more specifically.

[2] Interest in quantum information has been almost non-existent in accounting, with the notable exception of Fellingham and Schroeder (forthcoming), and their earlier working papers, in which they explore an application of entanglement to agency theory along with ''speculation on parallels between the double-entry system and the information system which shows up in the entangled qubit control problems''.