

Triple-Entry Accounting Using Blockchain

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Abstract:

The objective of this research is to investigate Triple Entry Accounting (TEA), an evolution from the traditional double entry bookkeeping. To start, the traditional double entry system provides internal consistency but is subject to information asymmetry, reconciliation challenges, and human fraud. This research aims to investigate whether a "single source of truth" for inter-corporate transactions can be achieved by utilizing a third entry in a blockchain system. The methodology used is a simulation created in Microsoft Excel.

The research looks into the various advantages of the application of Triple-Entry Accounting. The research results show that a Triple-Entry system provides a 100% detection capability for quantitative discrepancies, reducing the "time to detection" from weeks to seconds. Additionally, the research demonstrates how AI can be used as a complementary tool to assist with continuous assurance. The research concludes that the move to a Triple-Entry system is not merely a technical evolution, but a shift to a system of "financial transparency" and "proof of solvency." With the elimination of the need for retrospective reconciliation, Triple-Entry Accounting opens the door to a dynamic reporting environment that will increase the integrity of global financial markets.

Keywords:

Triple-Entry Accounting (TEA), Double-Entry Accounting (DEA), Blockchain, Real-Time Financial Reporting, Continuous Assurance

Introduction: "The What & Why"

For more than five centuries, the traditional double-entry accounting system has been the standard for recording, classifying, and reporting financial transactions. However, despite its effectiveness in bookkeeping, the double-entry system is susceptible to fraud and errors. To clarify, as digitalization takes over the world, the limitations of double-entry accounting are becoming more apparent, with results taking months to be fully verified. The main reason behind this elatedness is that when two companies perform a transaction, they each record it separately in their private books. The auditor must then manually reconcile both records to ensure they match; a process that is labor-intensive and prone to information asymmetry, where stakeholders must wait until official publication of the quarterly reports to double-check their data.

Indeed, the emergence of Blockchain technology and its adoption in accounting provides more secure and standardized financial records for businesses operating on a large scale. Using Blockchain, the concept of Triple-Entry Accounting (TEA) was first initiated in the early 2000s by Ian Grigg – a financial cryptographer and crypto-plumber. Triple-Entry Accounting introduces cryptographically secure and immutable shared records of transactions, stored on a blockchain. To explain further, Triple-Entry Accounting adds a third dimension to the transaction where data is recorded on a shared ledger that is available to regulators and auditors in real time. This way, every transaction is simultaneously validated and recorded, transforming auditing from a backdated, slow process into a real-time verification process.

Therefore, this research paper aims to dive into the feasibility and implications of transitioning from a double-entry system to a blockchain triple-entry framework. Can Triple-Entry Accounting using Blockchain technology reduce fraud, enhance transparency, and improve efficiency in financial reporting?

Literature Review: "The story so far "

Yuji Ijiri – an accounting professor, first introduced the academic foundation of triple-entry accounting in 1986. However, his version remained as a mathematical approach that adds a third dimension to measure the rate of change over time; lacking the decentralized infrastructure required for global implementation. Indeed, in 2005, the official triple-entry concept was introduced by Ian Grigg – a crypto financier who argued that “the receipt is the transaction.” In other words, Grigg proposed that there should be a secured third entry that is created and shared at the moment of exchange instead of two private records that get compared later. Ian Grigg’s work served as the theoretical foundation for integrating blockchain into financial reporting, allowing the triple-entry framework to be available worldwide. Later on, several researches have expanded on Ian Grigg’s idea, diving deeper into the benefits of blockchain in immutability and transparency. For example, in 2017, scholars such as Dai and Vasarhelyi explored how blockchain allows for “Continuous Auditing” and real-time verification of transactions. Their studies also revealed that since the triple-entry accounting system is a trusted framework that eliminates mistakes, implementing it would decrease the need for external audits from the Big Four accounting firms.

On the other hand, other researchers like Tan and Low, in 2019, highlighted several issues that come with the adoption of triple-entry accounting. To elaborate, for TEA to function globally, it must align with the international accounting standards (IFRS and GAAP). Hence, those standards must be updated to recognize digital and decentralized proofs as legal evidence. In this case, the adoption of blockchain will require clear guidelines and industry-wide collaborations to ensure that the transition occurs as smoothly as possible. Further, researchers stress that blockchain and AI are not replacements for human accountants. In fact, while AI offers quick results, and blockchain offers reliable results (the “what”), human professional judgement is still needed to determine the valuation and classification of transactions (the “why”).

Methodology: "The how we did it "

In order to demonstrate the superiority of Triple-Entry Accounting to the Double-Entry System, this methodology compares both frameworks through a controlled digital simulation on Microsoft Excel. The methodology is divided into three phases: the architectural setup, the transaction execution, and the automated audit layer.

Firstly, the setup of the simulation involves Entity A (the seller) and Entity B (the buyer), representing two corporations using their own double-entry journals. Additionally, a third environment is created as a shared ledger that serves as the triple-entry component. This shared ledger validates both entities through a unique cryptographic hash that must be matched on all three sheets.

Secondly, a series of transactions of different types are recorded on entities A and B including revenue recognition, inventory transfers, and accounts payable settlements. Moreover, deliberate human errors are introduced in one of the entities that cause the totals to mismatch; common errors that take weeks to be fully resolved when using the double-entry bookkeeping method.

Thirdly, the automated third environment simulates how AI and blockchain use underlying formulas to compare the entries of both entities and automatically flag mistakes that would otherwise go unnoticed. This process allows for the comparison of the time-to-detection difference between the triple-entry and double-entry accounting systems. In this case, the Microsoft Excel AI is used to handle data-matching tasks, while the human researcher is left with more time to perform high-level interpretations of the reports (Beainy & Kamel, 2023), which increases the efficiency of both firms in Microeconomic terms, and the entire financial system in Macroeconomic terms.

Results: "The facts "

The results of the Excel simulation provide a material contrast between traditional reporting and the triple-entry system. Indeed, fifteen out of the twenty transactions performed were marked as “System Match,” while five were “Manual Review Required.” The simulation highlighted the increased efficiency with Triple-Entry Accounting because of directly detecting the transactions containing discrepancies. In fact, the TEA framework displayed a 100% detection rate as it flagged every instance where entity A’s record did not match that of entity B. Compared with the

traditional double-entry system where these five errors would have piled up until the end-of-month or end-of-year audit, the TEA model detected each error as it occurred. This demonstrates the real-time nature of blockchain-based financial reporting and the efficiency that comes with implementing it.

In addition, to highlight the immutable nature of the records using blockchain, an attempt was made to change a transaction amount in Entity B's internal ledger after having been validated. The Excel logic directly flagged the "Hash Mismatch," showing that an attempt to alter the historical data has been made. Alongside efficiency in detecting errors, Triple-Entry provides much more details by attaching "Metadata" – digital tags with timestamps and unique codes that dictate every single move. This process automates the long fact-checking process and provides a live "Proof of Solvency" for companies. To elaborate, with the current accounting system, a Balance Sheet is a financial statement only accurate in the instance that it is made. Meanwhile, Triple-Entry Reports provide a live Balance Sheet that gets adjusted in real time, after every transaction. In turn, this revolutionizes accounting and bookkeeping, giving stakeholders a new level of financial transparency and data accuracy that is impossible to be achieved with the old way of doing books.

Discussion and conclusion: "The so what ? "

The results of this simulation validate that Triple-Entry Accounting using Blockchain offers a huge advancement in the world of financial reporting; specifically by moving the source of truth from private ledgers to a shared, immutable blockchain. Undoubtedly, it is essential to reinforce that the true value of blockchain and AI is not to replace the accounting profession, but to replace the "Reconciliation Gap." To explain, when the time to detect errors is reduced to zero, the role of the auditor is no longer a "historical investigator," but a "real-time risk manager." This is the end of "Audit Season" and the beginning of "Continuous Assurance."

However, a number of challenges arise with the implementation of TEA such as:

- Privacy concerns from sharing a company's information on a blockchain, which may be resolved by using a "permissioned" or private blockchain.
- Algorithmic bias, or the risk of AI overlooking certain types of fraud. This brings us back to the important role of the accountant and using AI as a complementary source not a replacement.

In conclusion, this project has shown that the adoption of Triple-Entry Accounting using Blockchain resolves the trust and time efficiency problems in the traditional double-entry system. Despite all the technical challenges of adopting TEA, embracing AI as a helper in the financial reporting profession brings several advantages that are not possible to achieve using the current Double-Entry Accounting System. Thus, accountants must be comfortable with using blockchain and AI to aid in their work, and companies and reporting standards must be updated in order to adopt this new framework.

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