

Blockchain-based Decentralized Validation of Tax Processes

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Abstract: Law obliges businesses to take effective measures to ensure tax compliance. Non-compliance may have serious consequences, ranging from fines to criminal sanctions. Recently, the application of distributed ledger technology has been proposed to facilitate tax compliance for businesses, but also to increase the efficiency of tax administrations. In this work, we propose the use of distributed ledger technology to enable efficient information exchange between businesses, tax administrations, and auditors. In our solution, tax process models serve as the basis for implementing smart contract logic. Finally, we discuss the challenges that hinder the adoption of distributed ledger technology in practice and give an outlook on decentrally enforced compliance

Keywords: blockchain; tax compliance; tax technology

1 Motivation

Ensuring tax compliance is vital for businesses. A violation of tax laws may have far-reaching consequences including financial penalties and criminal charges. Tax compliance not only comprises a process execution according to regulations but also a documentation of the process execution. For instance, German law requires businesses to verify the validity of a business partner's value-added tax identification number (VAT id) before issuing an invoice. Moreover, the businesses are expected to document the verification process and provide the documentation to the authorities upon request. Furthermore, the required documentation must comply with the principles for the proper bookkeeping and storage of books, records and documents in electronic form and data access³. These principles include rather basic concepts such as availability and immutability of information and apply to different types of taxes and related documentation obligations. Since state financing depends on taxes, the legislator justifies these stringent regulations to avoid tax fraud and tax evasion. However, on the businesses' side, these regulations result in additional efforts.

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³ translation of the original administrative regulation title "Grundsätze zur ordnungsmäßigen Führung und Aufbewahrung von Büchern, Aufzeichnungen und Unterlagen in elektronischer Form sowie zum Datenzugriff (GoBD)"

2 Application of Distributed Ledger Technology in Tax Compliance

Recently, the distributed ledger technology (DLT) has been discussed as means to enable efficient tax compliance for businesses and authorities [AS16, Fa18, FHF19, Od17]. DLT enables businesses to immutably record transactions that are relevant to tax law. Moreover, the decentralized structure and data replication ensures the availability of tax information. Therefore, we propose a DLT-based tax information system which enables the exchange and validation of tax-relevant information. In our solution, smart contract functions cover process execution logic as well as the constraints required by tax regulations. Moreover, we use smart contracts to immutably store documents created or modified during process execution. This allows auditors to easily trace past business transactions.

3 Challenges

The application of DLT in taxation entails a couple of organizational as well as technical challenges that hinder a fast adoption in practice. Although DLT is strong in validating information within the ledger, it does not comprise any mechanisms to ensure that the information provided matches the real-world business case. In our application, tax process models serve as the basis for the implementation of smart contracts. Nevertheless, process modeling languages like BPMN lack DLT-specific concepts. Moreover, the implementation of a DLT-based information system is always a trade-off between the two opposing goals of transparency and confidentiality. For example, while the public and tax administrations benefit from increased tax transparency, businesses are concerned about the disclosure of sensitive information. More critically, distributing the storage and validation of data across different actors makes DLT naturally weak in ensuring confidentiality. However, recent work shows that the introduction of zero-knowledge proof techniques into DLT might help to overcome this drawback [FHF20, NVV18]. Zero-knowledge proofs enable a party to demonstrate properties of confidential data to another party without revealing the actual data. For example, a business could prove that the tax rate of an invoice document is either 7% or 19% without revealing the actual tax rate.

4 Conclusion

Despite the challenges of a decentralized validation of tax processes, DLT represents a promising solution to ease tax compliance and enforce tax laws. Since taxation logic and process logic is stored in smart contracts, the logic for processing and analyzing tax data is publicly verifiable. Thus, the decentralized execution of these smart contracts results in an unambiguous and comprehensible taxation of businesses. This could lead to a collaboration of countries in matters of tax that does not rely on the trust in the fulfillment of negotiated agreements.

References

- [AS16] Ainsworth, Richard Thompson; Shact, Andrew: Blockchain (Distributed Ledger Technology) Solves VAT Fraud. SSRN, 2016.
- [Fa18] Fatz, Filip; Fettke, Peter; Hake, Philip; Risse, Robert: Potenziale von Blockchain-Anwendungen im Steuerbereich. *HMD Praxis der Wirtschaftsinformatik*, 55(6):1231–1243, 2018.
- [FHF19] Fatz, Filip; Hake, Philip; Fettke, Peter: Towards Tax Compliance by Design: A Decentralized Validation of Tax Processes Using Blockchain Technology. In: IEEE 21st Conference on Business Informatics (CBI 2019). pp. 559–568, 2019.
- [FHF20] Fatz, Filip; Hake, Philip; Fettke, Peter: Confidentiality-preserving Validation of Tax Documents on the Blockchain. In: Proc. 15. Internationale Tagung Wirtschaftsinformatik (WI 2020). 2020.
- [NVV18] Narula, Neha; Vasquez, Willy; Virza, Madars: zkLedger: Privacy-Preserving Auditing for Distributed Ledgers. In: Proceedings of the 15th USENIX Symposium on Networked Systems Design and Implementation (NSDI 18). pp. 65–80, 2018.
- [Od17] Owens, Jeffrey; de Jong, Julia: Taxation on the Blockchain: Opportunities and Challenges. *Tax Notes International*, Aug 7:601–612, 2017.