



Tokenization of sukuk: Ethereum case study

Nida Khan ^a , Bilal Kchouri ^b , Nissar Ahmad Yatoo ^c , Zsofia Kräussl ^b , Anass Patel ^d ,
Radu State ^a

Show more

Share Cite

<https://doi.org/10.1016/j.gfj.2020.100539>

[Get rights and content](#)

Abstract

Sukuk is a financial instrument that provides returns similar to conventional bonds. It has served to cater to the capital requirements of big corporations and governments, while circumventing interest to adhere to the Shariah law. Sukuk can be touted as Shariah-compliant bonds that rank among the most successful and the fastest growing financial instrument in the Islamic economy. The sukuk research area is marked by a dearth of quantitative literature, compared to qualitative academic work. This paper seeks to fill this existing gap, and introduces a novel, exploratory analysis of sukuk tokenization based on a case study. The funding needs of small and medium enterprises remains largely unmet through sukuk on account of the high costs involved, among other reasons. As we show in this paper, blockchains can aid to lower the cost incurred through the tokenization of sukuk. We highlight some of the key challenges involved in the issuance of sukuk and discuss their resolution using blockchain. We also provide a taxonomy of blockchain applications in finance, with a particular focus on Islamic finance. Our paper reviews different blockchain architectures to assess their viability for tokenization. We conduct a novel case study on sukuk tokenization by implementing a basic smart contract for Sukuk al-Murabaha on Ethereum. The paper concludes by a conceptual analysis of feasibility concerns, based on a comparison of the conducted cost-benefit analysis of conventional sukuk issuance with tokenization.

Introduction

The Islamic finance (IF) market will be worth US 3.5 trillion by 2024 (Mohamed & Taitoon, 2019) and Moody estimations predict an increase in sovereign and supranational sukuk issuance to over \$93 billion in 2020 (Moody's, 2019). There exists a strong demand for Shariah-compliant securities from IF institutions. Sukuk offers a stable methodology of financing to institutions looking to diversify their sources of financing. The various projections reinforce the strong foothold of this relatively nascent financial industry. The emergence of new technologies poses a threat to the finance industry and consequently the IF industry is also facing inevitable disruption by a storm of nascent technologies. Blockchain counts as the most potent to cause such a disruption, as the emerging academic literature in finance also argues (see (Yermack, 2017)). If the industry does not innovate and adopt to such disruptive trends, then there is a likelihood of a loss of existing client base. The conventional sector is using blockchain to create digital assets like stocks, bonds and land titles e.g. NASDAQ, Chain. The IF industry is also venturing in these areas by creating Sukuk or Islamic bonds on top of the blockchain. The IF sector has witnessed the rise of Sakkex (Sakkex, 2018) and SmartSukuk (<https://blossomfinance.com/press/world-s-first-primary-sukuk-issuance-on-blockchain-closes>, 2019), which are blockchain-based sukuk issuing platforms. Employment of emerging technologies, in this era of disruption, is an opportunity for the sector to reinvent the established methodologies by incorporating novel technologies to progress ahead of the financial technology startups.

Sukuk has immense potential to fund startups and small and medium enterprises (SMEs). However, sukuk issuance remains confined to large corporations and governments, with the primary target market being large investment funds. The smallest issue is still limited to millions with capital needs of SMEs and startups in the IF domain remaining largely unmet through sukuk. The employment of sukuk for funding SMEs can help to expand the Islamic economy and increase the user base. In (Solé, 2008), Solé describes sukuk issuance and SME financing using a concrete setup of Kuwait and in (Patel, 2014), Patel describes a similar setup for the French market. In these discussions the need for lower transaction costs, transparency and a lack of historic-track record is highlighted, which can be resolved using blockchain.

Sukuk issuance remains plagued with several challenges, the primary being the involvement of multiple intermediaries resulting in both high costs and an increase in the probability of human error. Tokenization of bonds is an application of blockchain technology to lower the various costs associated with the issuance process. Sukuk are Islamic bonds that can also benefit from tokenization by increasing the operational efficiency, cost reduction and enhancing transparency, which is one of the primary characteristics of blockchain. Transparency is also one of the essential attributes that would serve as validation of Shariah adherence for the masses. Notable organizations have tokenized bonds including World Bank, which launched *bond-i*, which was the world's first bond to be created, allocated, transferred and managed through Ethereum blockchain platform (The World Bank, 2018). In 2019 secondary bond trading was enabled on the *bond-i* platform, which was also a pioneer in the world. The Central Bank of China recently issued \$2.8 billion of special bonds

to fund small and micro-enterprise businesses, using their self-developed blockchain issuance system (Kuznetsov, 2019).

The IF domain is characterized by research on sukuk that is largely qualitative rather than quantitative and overall research in sukuk in IF is still underdeveloped (Zulkhibri, 2015). The present paper seeks to fill this gap. In this paper, we tokenize Sukuk al-Murabaha using Ethereum through smart contracts to program the necessary conditions like payment frequency, registering investors, automating the periodic payments to the investors while getting the deferred payment amount from the purchaser of the Murabaha asset. We do a cost-benefit analysis of sukuk tokenization with conventional sukuk issuance and conduct a feasibility analysis based on our results. This paper thus provides an impact-assessment approach for institutions, SMEs and even startups to support the adoption of blockchains for sukuk issuance. As a consequence, our analytical approach allows organizations to prepare for current market challenges in a systemically efficient manner, by understanding the cost and performance consequences of tokenization. Our paper is therefore a pioneer in the finance domain.

The rest of the paper is organised as follows. Related work is given in the paper in Section 2. The paper gives the requisite background on sukuk in Section 3.1, including the key challenges and circumvention of some of the challenges encountered during sukuk issuance. Relevant background on blockchain technology is given in Section 3.2 while a taxonomy of blockchain applications in the financial sector is given in Section 4. An assessment of the available blockchain platforms in the context of their viability for usage in tokenization is given in Section 5. Tokenization of Sukuk al-Murabaha by means of a basic smart contract is elaborated upon in Section 6. The cost-benefit analysis is discussed in Section 7. Feasibility of tokenization of sukuk is discussed in Section 8 while the conclusion is given in Section 9.

Access through your organization

Check access to the full text by signing in through your organization.

Access through **your organization**

Section snippets

Related work

In (Schletz & Lee, 2020), Schletz et al. highlight that both debt and equity instruments can be managed by tokenization, which decreases transaction costs by disintermediation and automation, improves transparency, and thus shortens liquidity requirements. Nam and Yang in (Nam & Yang,

2017) observe that blockchain bonds convey information safely between the participating institutions, ensure access to the same distributed ledger through a smart contract and reduce the cost of processing ...

Sukuk

Sukuk represents the plural form of the Arabic word, Sakk, which means a certificate. Evidence of sukuk can be found as early as 1st century Hijri (Islamic Calendar) and in *Imam* Malik's 'Muwatta'. In the Umayyad dynasty, the government issued sukuk to public servants and soldiers, which they could redeem at the end of the fixed-term period in exchange for food commodity or sell to others prior to maturity (Marifa Academy, 2015). In 1988, Islamic Fiqh Academy (IFA) passed a resolution 30 (3/4), ...

Applications of blockchain in the financial sector

Blockchain technology finds applications in diverse domains ranging from e-commerce for traceability of shipped physical assets (Hasan & Salah, 2018a; Salah & Hasan, 2018) to solutions catering to monetization of data exchanges between IoT devices (Suliman, Husain, Abououf, Alblooshi, & Salah, 2019). Mobile telecommunications using 5G can leverage upon blockchain technology to enable novel business models and services (Chaer, Salah, Lima, Ray, & Sheltami, 2019) while blockchain can also be ...

Assessment of blockchain platforms for tokenization

In order to assess the feasibility of sukuk tokenization by measuring its performance, related costs and addressing its benefits, it is imperative to know that sukuk tokenization relies on employing smart contracts for execution. In this section, we review the blockchain platforms available that can support smart contracts. Smart contracts are heralded as the most important application of blockchain. A smart contract is a computer program that formalizes relationships over computer networks ...

Tokenization of sukuk

The applications of smart contract technology are diverse but restricting it to the financial world, it can be conveniently said that any kind of business logic relying on data can be coded by way of smart contracts. Securities that are based on payments and rights, which are executed according to predefined rules can be coded as a smart contract in capital markets. Experiments are ongoing on the issuance of smart bonds. Sukuk issuance follows a strict Shariah law and other principles, many of ...

Cost-benefit analysis

After introducing and analysing the technicalities related to sukuk tokenization, this section turns our analytical angle towards concerns of commercial, i.e. organizational adoption. Socio-economic, in particular financial feasibility concerns are often bottlenecks of technology adoption, as it is also argued in (Gordijn & Akkermans, 2003). Therefore, we first revisit our implementation and address its cost consequences as follows. The costs of the transactions on Ethereum were computed by ...

Sukuk tokenization: feasibility analysis

The results of the performed cost-benefit analysis thus brings us closer to understand the commercial, i.e. financial consequences of sukuk tokenization. Combined with the findings of the concrete implementation exercise of a basic smart contract for tokenization, we articulated and assessed important feasibility concerns from the commercial, i.e. the financial market point of view, including implications for regulatory compliance. In the following, we report our findings and emphasize their ...

Conclusion

In this paper we evaluated the present challenges in sukuk issuance and discussed circumvention of some of them using blockchain. We discussed the blockchain platforms, in the light of their architecture, that can prove to be suitable for sukuk tokenization. We elaborated on a taxonomy for blockchain applications in finance and the Islamic finance domain in particular. We conducted a case study on tokenization of Sukuk al-Murabaha on Ethereum and coded a basic smart contract to gauge the ...

CRedit authorship contribution statement

Nida Khan:Conceptualization, Methodology, Software, Writing - original draft, Visualization, Investigation, Data curation, Project administration, Resources, Formal analysis.**Bilal Kchouri:**Data curation, Writing - original draft, Investigation, Formal analysis.**Nissar Ahmad Yattoo:**Writing - review & editing.**Zsofia Kräussl:**Writing - review & editing.**Anass Patel:**Supervision, Funding acquisition.**Radu State:**Supervision. ...

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. ...

Acknowledgement

This work is funded by the Luxembourg National Research Fund under its AFR-PPP Programme, which is aimed at providing PhD and Post Doc grants for innovation and industry partnerships under grant number FNR11617092. ...

[Special issue articles](#) [Recommended articles](#)

References (69)

C. Agbo *et al.*

Blockchain technology in healthcare: A systematic review

Healthcare (2019)

T. Ajiboye

Ripple backs new platform for smart contracts flare networks via its Xpring

Aldar

FY 2019 financial statements

R. Almadhoun *et al.*

A user authentication scheme of IoT devices using blockchain-enabled fog nodes

AWS

EC2 instance pricing - Amazon Web Services (AWS)

AWS

Amazon EC2 reserved instances pricing

M. Bartoletti *et al.*

An empirical analysis of smart contracts: platforms, applications, and design patterns

(2017)

A. Chaer *et al.*

Blockchain for 5G: Opportunities and challenges

A. Chauhan *et al.*

Blockchain and scalability

J. Chiu *et al.*

Blockchain-based settlement for asset trading

The Review of Financial Studies (2019)

[View more references](#)

Cited by (47)

Tail risk transmission in technology-driven markets

2023, Global Finance Journal

Citation Excerpt :

...These results show the digital finance revolutions of technological progress. Khan et al. (2022) discussed the blockchain platforms considering their architecture that can prove suitable for financial tokenization. The time-varying results of tail risk transmission pressure indicate that higher risk transmission is related to long-term developments, with several significant events affecting the market risk spillover....

[Show abstract](#)

Blockchain in banking and finance: A bibliometric review

2022, Research in International Business and Finance

Citation Excerpt :

...Very close to microfinance and solidarity cryptocurrencies research is a sub-stream dealing with Shari'a compliant blockchain solutions. Khan et al. (2020) elaborate a taxonomy for blockchain applications in the Islamic finance context. Moreover, the authors experiment the tokenization of Sukuk al-Murabaha on Ethereum and coded a basic Shari'a compliant smart contract and find two main obstacles that need to be overcome before Islamic blockchain-based financial solutions may have a foothold....

[Show abstract](#)

Fintech in islamic finance literature: A review

2022, Heliyon

Citation Excerpt :

...Hence, it increases the accountability in financial services, which in turn, promotes trust between the parties (Chong, 2021). Furthermore, Delle Foglie et al. (2021) and Busari and Aminu (2021) demonstrated that the adoption of smart contract and tokenization on Sukuk would support the development of Sukuk by reducing operational cost, assuring shariah compliance, strengthening standardization, removing the ambiguities from shariah interpretations, and speed-up the transaction process (N. Khan et al., 2022). Despite the numerous advantages of implementing blockchain technology in Islamic financial services, the lack of legal regulation related to blockchain, the absence of shariah standard of Islamic FinTech, and the complexity of Islamic finance principles become the primary factors that prevent the escalation of blockchain integration in Islamic financial institutions (Alaeddin et al., 2021)....

[Show abstract](#)

[The governance technology for blockchain systems: a survey ↗](#)

2024, Frontiers of Computer Science

[What motivates retail investors to invest in government-issued digital sukuk during COVID-19? ↗](#)

2022, Journal of Islamic Accounting and Business Research

[Ṣukūk on blockchain: a legal, regulatory and Sharī'ah review ↗](#)

2020, Isra International Journal of Islamic Finance



[View all citing articles on Scopus ↗](#)

[View full text](#)

© 2020 Elsevier Inc. All rights reserved.



All content on this site: Copyright © 2026 Elsevier B.V., its licensors, and contributors. All rights are reserved, including those for text and data mining, AI training, and similar technologies. For all open access content, the relevant licensing terms apply.

